

STRABOEXPERIMENTAL

USER GUIDE

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1 Introduction

1.1 Welcome to StraboExperimental

StraboExperimental is a modern web application designed to manage and archive experimental geophysical data, with a particular focus on rock deformation experiments. As part of the StraboSpot ecosystem, it enables seamless integration across experimental, microstructural (StraboMicro), and field data (StraboField).

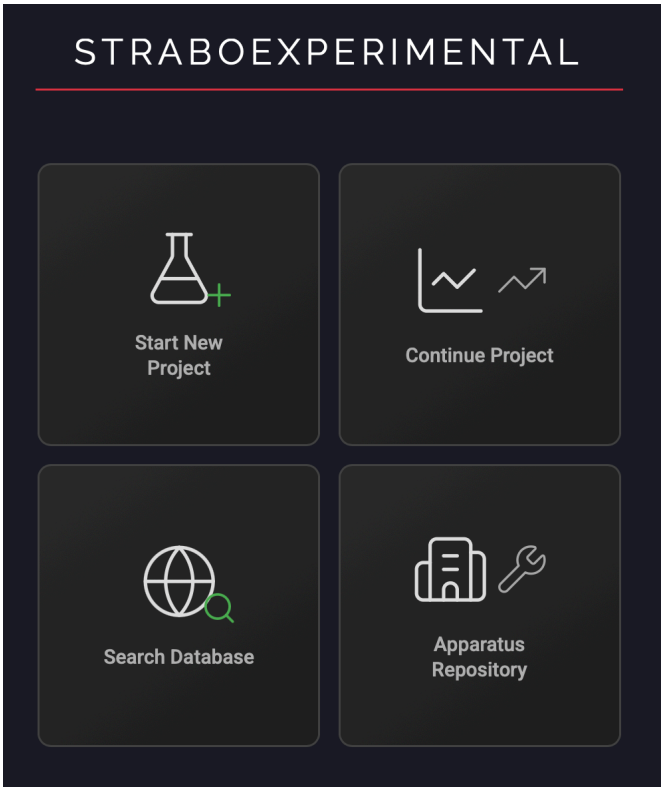


Figure 1. The StraboExperimental home page provides access to your projects, the Apparatus Repository, and other key features.

The application provides researchers with a comprehensive platform for documenting laboratory experiments, including:

- **Facility and Apparatus Management:** Maintain detailed records of research facilities and experimental equipment
- **Sample Documentation:** Record material properties, provenance, texture, and composition
- **Experiment Configuration:** Document experimental setups, protocols, and controlled variables
- **Data Acquisition (DAQ):** Configure and document data collection systems, sensors, and calibrations
- **Data Management:** Organize experimental datasets with comprehensive metadata

1.2 The StraboSpot Ecosystem

StraboSpot is a comprehensive digital data system designed to facilitate the collection, management, integration, and sharing of field and laboratory data in the Geological Sciences. The ecosystem consists of three interconnected applications:

- **StraboField:** Mobile application for field data collection, enabling geologists to record observations, measurements, and images directly in the field
- **StraboMicro:** Desktop application for microscopy data management, supporting petrographic analysis and microstructural observations
- **StraboExperimental:** Web application for laboratory experiment data management, implementing the LAPS (Laboratory Apparatus and Protocol Schema) standard

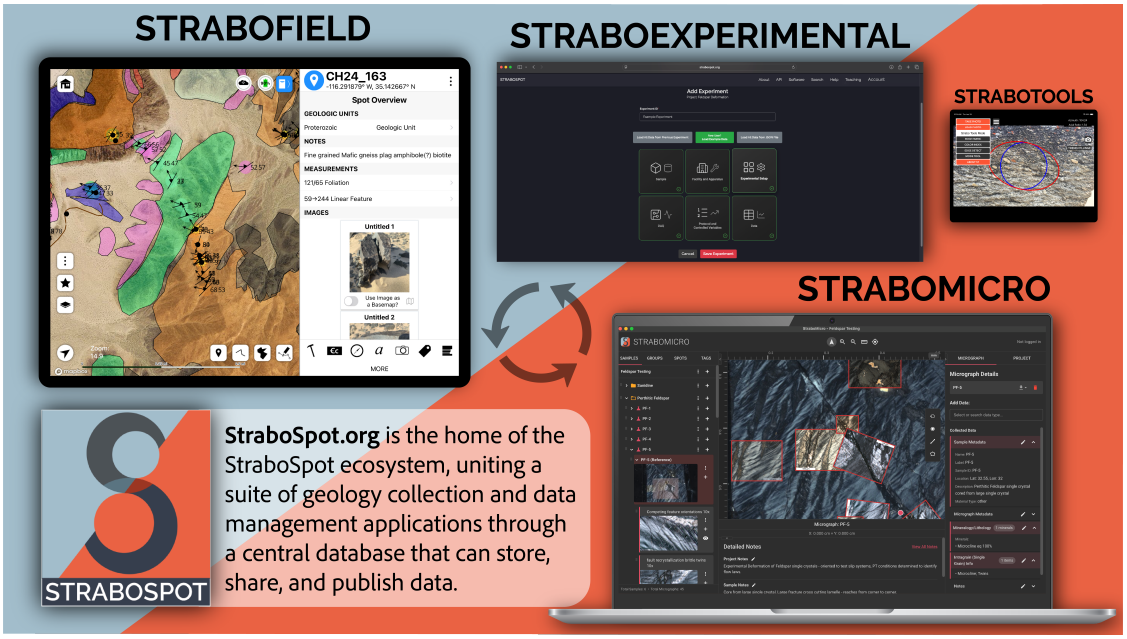


Figure 2. The StraboSpot ecosystem integrates field, microscopy, and experimental data through a shared database infrastructure.

All three applications share a common database infrastructure and user authentication system, allowing researchers to maintain integrated datasets that span from field observations to laboratory analyses.

1.3 The LAPS Schema

StraboExperimental implements the **LAPS (Laboratory Apparatus and Protocol Schema)**, a standardized data schema developed collaboratively by MIT's CORD (Consortium for Rock Deformation) and the StraboSpot team. LAPS provides:

- A standard vocabulary for describing laboratory experiments
- Structured data formats for apparatus, samples, protocols, and data
- Interoperability between different laboratories and research institutions
- Compliance with FAIR (Findable, Accessible, Interoperable, Reusable) data principles

The schema organizes experimental data hierarchically:

```
Project
      Experiment
            Facility
            Apparatus (with Parameters and Documents)
            Sample (with Material, Provenance, Texture, Composition)
            Experimental Setup (with Geometry, Protocol)
            DAQ (with Devices and Channels)
            Data (with Datasets and Parameters)
```

For detailed information about the LAPS schema, see Appendix 9.3.

1.4 Key Features

Open and Accessible

- Open-source, publicly funded, and free to use
- Web-based interface accessible from any modern browser
- No software installation required

Comprehensive Metadata Capture

- Detailed apparatus configuration and operating procedures
- Complete sensor and data acquisition documentation
- Sample properties including material type, provenance, and preparation
- Step-by-step experimental protocols

Apparatus Repository

- Public repository of experimental equipment across institutions
- Encourages reproducibility and collaboration
- Reusable apparatus profiles for consistent documentation

Data Sharing and Export

- Full metadata import/export in standardized JSON format
- PDF export for formatted reports
- Granular access control for visibility and permissions
- Public REST API for automated access and integration

Workflow Efficiency

- Reusable templates for efficient and consistent data entry
- Bulk data loading from previous experiments
- Example data for new users

1.5 System Requirements

StraboExperimental is a web application that runs in your browser. The following requirements apply:

- **Web Browser:** Modern browser with JavaScript enabled
  - Google Chrome (recommended)
  - Mozilla Firefox
  - Microsoft Edge
  - Safari
- **Internet Connection:** Required for all operations
- **Screen Resolution:** Minimum 1280x720 recommended for optimal experience
- **StraboSpot Account:** Required for creating and managing experiments

Browser Recommendations

For the best experience with StraboExperimental:

- **Recommended:** Google Chrome (latest version)
- **Supported:** Mozilla Firefox, Microsoft Edge, Safari
- **Settings:** Ensure JavaScript is enabled
- **Cookies:** Allow cookies from strabospot.org for session management
- **Pop-ups:** Allow pop-ups for download functionality

1.6 Getting Help

For support and resources, please visit `https://strabospot.org/help`. Available resources include:

- **Documentation:** Access the latest *StraboExperimental User Guide*, available in the Experimental section of the help page.
- **Video Tutorials:** View instructional video tutorials to guide your use of StraboSpot applications.
- **Office Hours:** Sign up for Office Hours through the StraboSpot help page to receive direct assistance.

- **Community:** Engage with other researchers using StraboSpot at conferences, workshops, and online forums.

1.7 Acknowledgments

StraboExperimental is developed with support from:

- National Science Foundation (NSF Award 1948453)
- MIT Consortium for Rock Deformation (CORD)
- The Experimental Geophysics Community

The LAPS schema was developed collaboratively with input from the experimental rock deformation community to identify vocabulary necessary for experimental equipment, procedures, data acquisition, sample description, and storage formats.

2 Installation and Setup

StraboExperimental is a web-based application that requires no software installation. This section covers account creation and initial setup.

2.1 Creating a StraboSpot Account

To use StraboExperimental, you need a StraboSpot account. This same account provides access to all StraboSpot applications (StraboField, StraboMicro, and StraboExperimental).

To create a new account:

1. Open your web browser and navigate to `https://strabospot.org`
2. Click on **Account > Register** in the top navigation menu
3. Complete the registration form with the following information:
    - **Email Address:** Your institutional or personal email (this will be your username)
    - **Password:** Choose a secure password
    - **Confirm Password:** Re-enter your password
    - **First Name:** Your preferred first name
    - **Last Name:** Your preferred last name
    - **Institution:** Your research institution, university, or employer, if applicable
4. Review and accept the terms of service
5. Click **Create Account**
6. Check your email for a verification message and follow the instructions to activate your account

Note: Your email address serves as your unique identifier across all StraboSpot applications. Refer to Figure 3 for a screenshot of the registration form.

2.2 Logging In

Once your account is created and verified:

1. Navigate to `https://strabospot.org`
2. Click on **Account > Login** in the top navigation menu
3. Enter your email address and password
4. Click **Sign In**

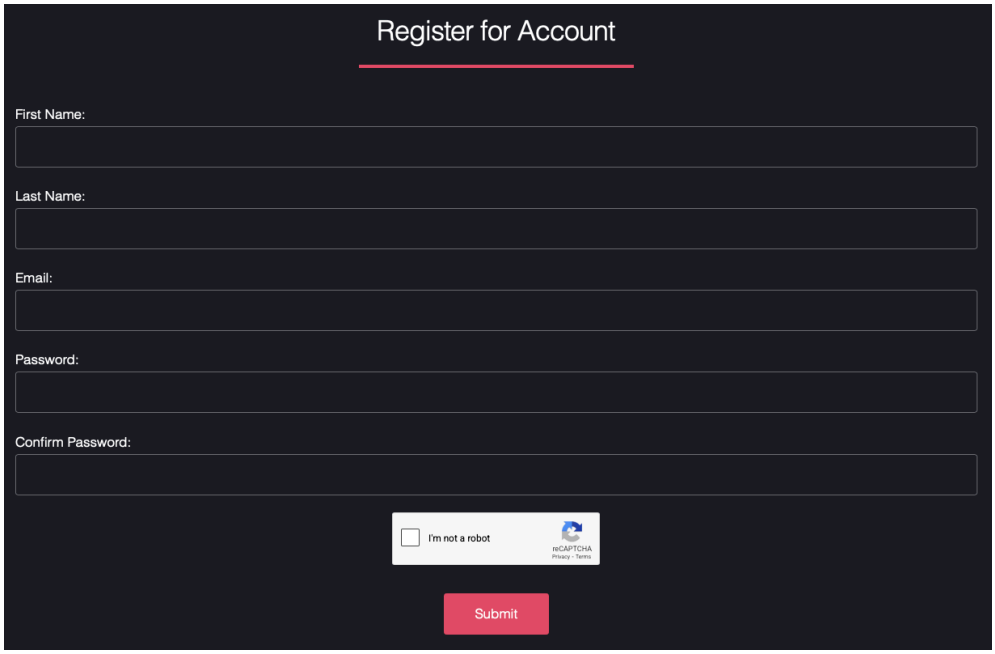


Figure 3. The StraboSpot registration form. Complete all required fields to create your account.

2.3 Accessing StraboExperimental

To access StraboExperimental after logging in:

1. From the StraboSpot homepage, click on **Software**
2. Select **StraboExperimental** to access the StraboExperimental interface
3. Alternatively, navigate directly to the experimental projects page from **Account**, and select **My StraboExperimental Data**

You will be presented with your StraboExperimental home page, showing:

- Start New Project
- Continue Project
- Search Database
- Apparatus Repository

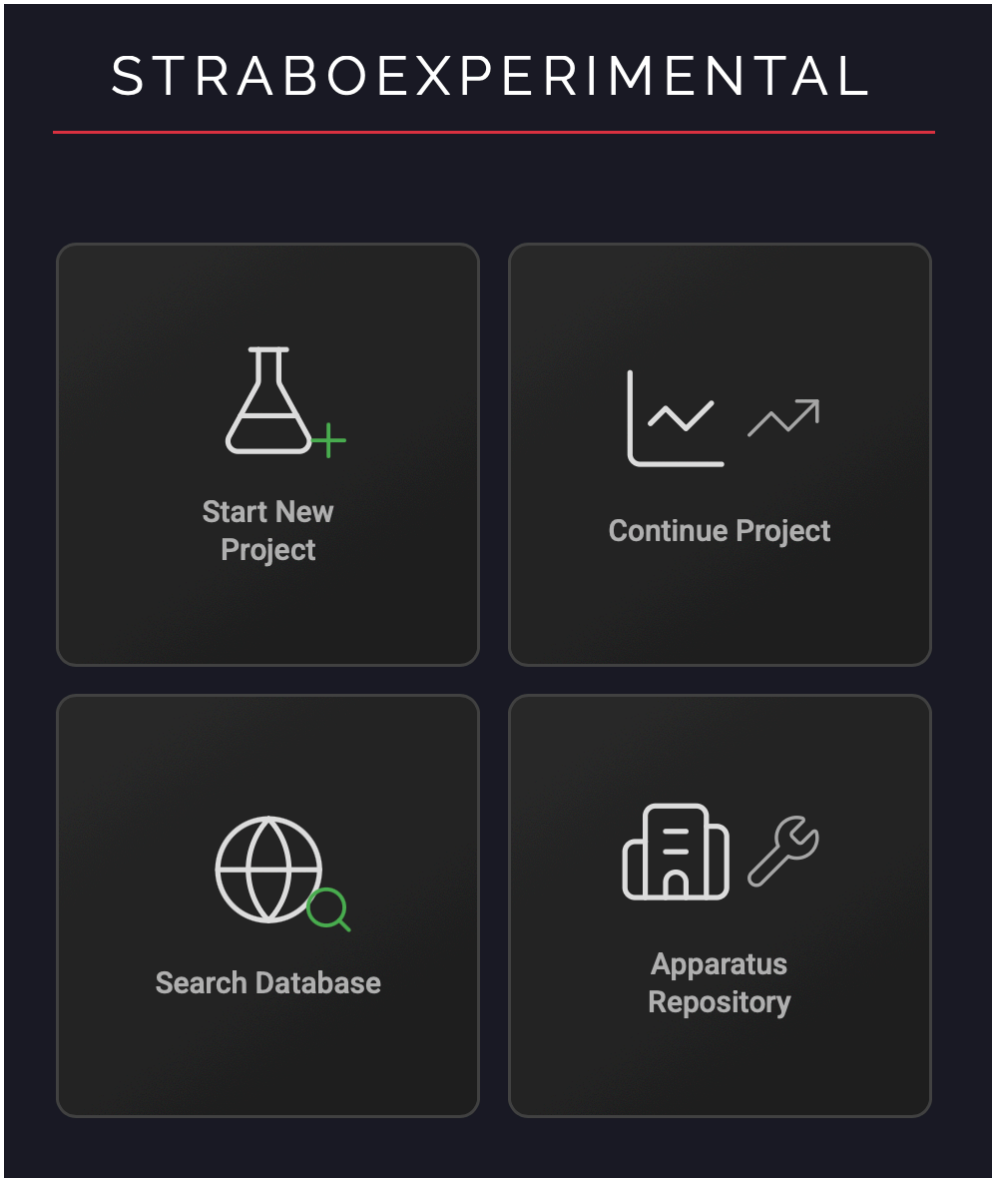


Figure 4. The StraboExperimental home page for a new user. Click Start New Project to begin.

2.4 First-Time Setup

When you first access StraboExperimental, consider the following setup steps:

2.4.1 Explore Example Data

If you are new to StraboExperimental, you can load example data to familiarize yourself with the interface:

1. Create a new project (see Section 4.1)
2. Add a new experiment to the project
3. Click **New User? Load Example Data** in the bulk load bar
4. Explore the pre-populated fields to understand the data structure

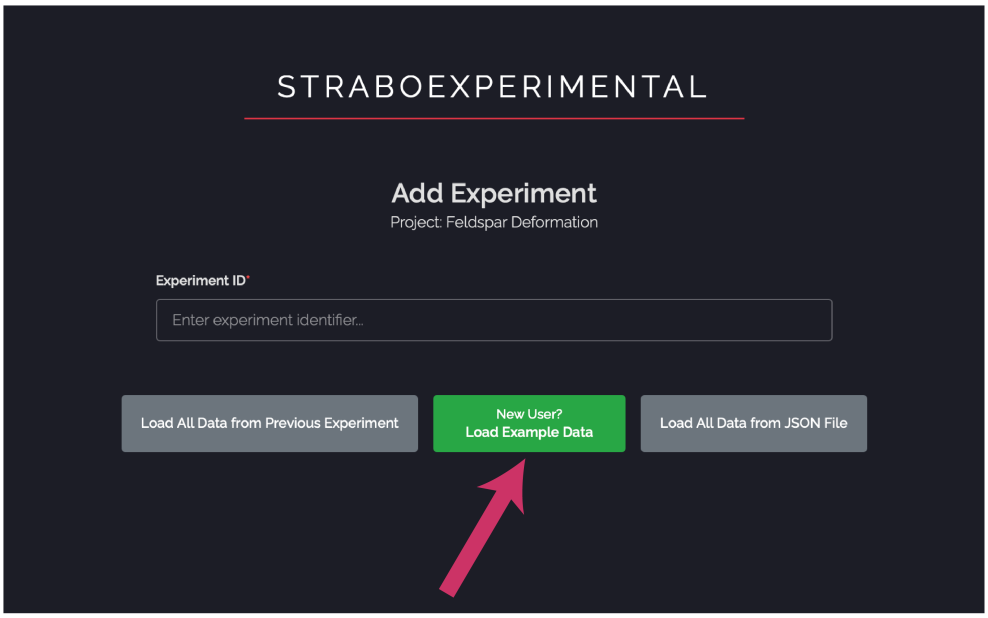


Figure 5. New users can load example data to explore the interface and understand the data structure.

2.4.2 Browse the Apparatus Repository

The Apparatus Repository contains publicly shared equipment profiles, see Section 6 for more information:

1. Click on **Apparatus Repository** from the StraboExperimental home page
2. Browse facilities and their associated apparatus
3. View apparatus details to understand documentation standards
4. Note equipment that may be relevant to your research

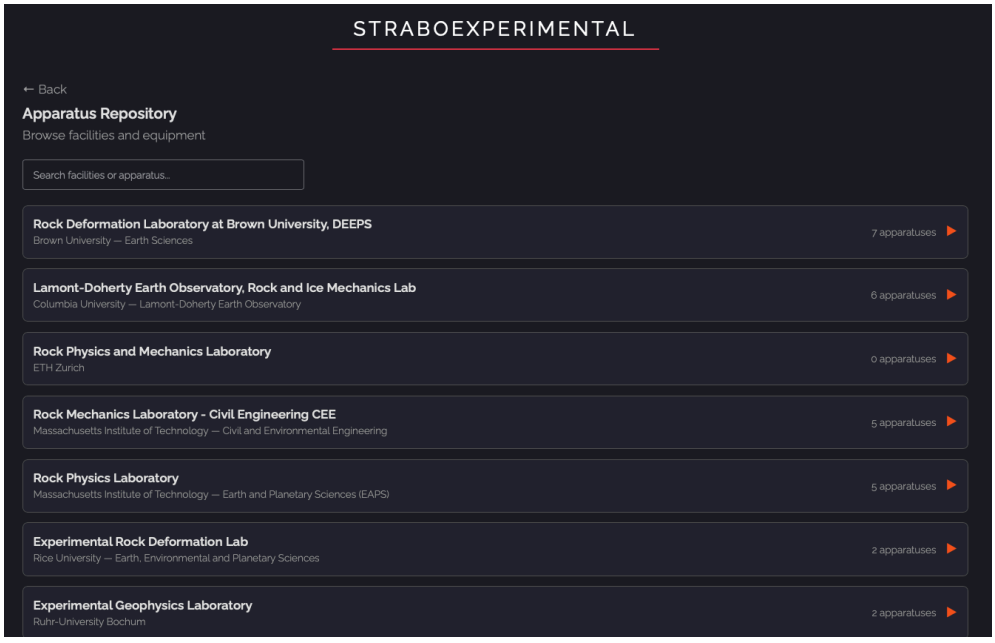


Figure 6. The Apparatus Repository lists facilities and their experimental equipment. Click on a facility to view its apparatus.

2.5 Session Management

StraboExperimental uses session-based authentication:

- Sessions remain active while you are using the application
- Extended inactivity may require re-authentication
- Always log out when using shared computers
- Your data is saved to the server as you work

Important: StraboExperimental automatically saves your work as you navigate between sections. There is no need to manually save unless you want to ensure all changes are committed before closing your browser.

2.6 Change Password

If you need to change your password:

1. Navigate to `https://strabospot.org`
2. Click on **Login** and enter your current credentials
3. Click on **Account** drop down menu, it will list your email address
4. Enter your current password, create a new password, and confirm your new password
5. Click Submit

2.7 Password Recovery

If you forget your password:

1. Navigate to `https://strabospot.org`
2. Click on **Login**
3. Click on **Forgot Password?**
4. Enter your registered email address
5. Check your email for password reset instructions
6. Follow the link to create a new password

3 User Interface Overview

This section provides an overview of the StraboExperimental user interface, including navigation, key components, and interaction patterns.

3.1 Home Page

The StraboExperimental home page (Figure 4) serves as your dashboard and provides quick access to:

Quick Actions

- **Add New Project:** Start a new project [Refer to Section 4]
- **Continue Project:** Opens the My StraboExperimental Data [Refer to Section 4]
- **Apparatus Repository:** Browse public equipment listings [Refer to Section 6]
- **Search Database:** Find public experiments [Refer to Section 7.9]

3.2 Experiment Page

When adding or editing an experiment, you are presented with six tiles representing the LAPS data sections:

1. **Sample:** Material properties, provenance, and composition [Refer to Section 5.2]
2. **Facility and Apparatus:** Equipment and location details [Refer to Section 5.3.4]
3. **Experimental Setup:** Test configuration and geometry [Refer to Section 5.4]
4. **DAQ:** Data acquisition system and channels [Refer to Section ??]
5. **Protocol:** Step-by-step experimental procedures [Refer to Section 5.6]
6. **Data:** Datasets and experimental results [Refer to Section 5.7]

3.2.1 Status Indicators

Each tile displays a visual indicator:

- **Green checkmark:** Section contains data
- **Empty:** Section has not been configured

Click on any tile to open the corresponding form section. See Figure 7 for an example.

3.3 Bulk Load Bar

When creating or editing experiments, the bulk load bar provides options to populate data:

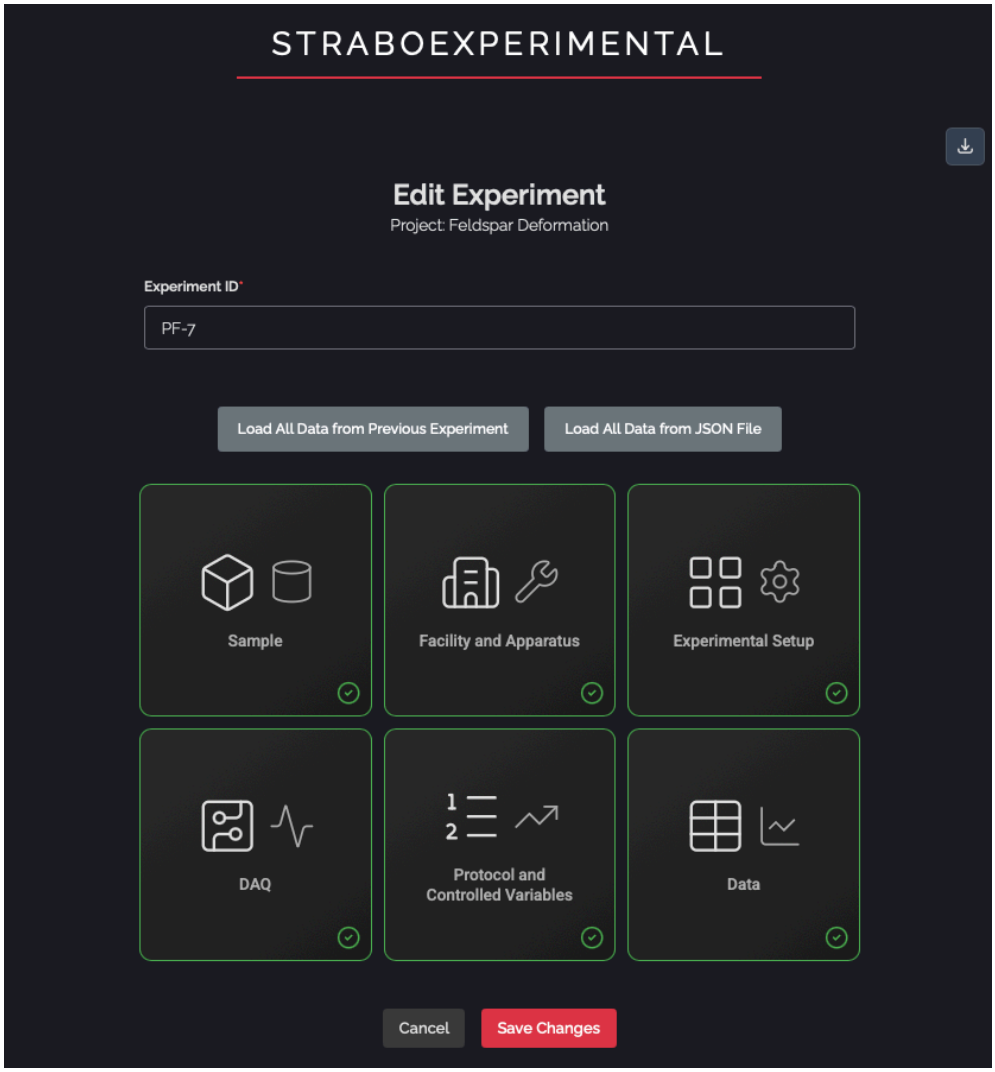


Figure 7. The experiment home page provides visual navigation to each LAPS section. Green checkmarks indicate sections with data.

- **Load All Data from Previous Experiment:** Copy data from an existing experiment in your account
- **New User? Load Example Data:** Populate with sample data to explore the interface (available only when adding new experiments)
- **Load All Data from JSON File:** Import data from a previously exported JSON file

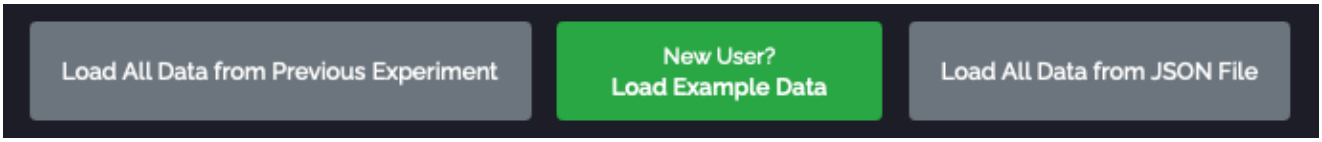


Figure 8. The bulk load bar provides options to quickly populate experiment data from various sources.

3.4 Section Load Bar

Within each form section, a section-specific load bar offers:

- **From Previous Experiment:** Load only this section's data from another experiment

- **From JSON File:** Import section data from a JSON file
- **From Apparatus Repository:** (Facility/Apparatus section only) Select from public equipment profiles
- **Clear Interface:** Reset the current section to empty

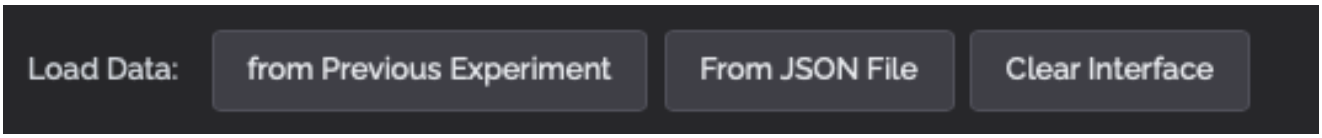


Figure 9. The section load bar allows loading data for individual sections from various sources.

4 Projects

Projects are the top-level organizational unit in StraboExperimental. Each project contains one or more experiments and serves as a container for related research activities.

In StraboExperimental:

- A **Project** groups related experiments together
- Projects have a name and optional description
- Each project can contain multiple experiments
- Projects can be private (default) or made public for sharing
- Only you can edit your own projects unless collaboration is enabled

4.1 Creating a New Project

To create a new project:

1. From the StraboExperimental home page, click **Start New Project**
2. Enter the project details:
    - **Project Name** (required): A descriptive name for your project
    - **Description** (optional): Additional details about the project's purpose and scope
3. Click **Create Project** to create the project

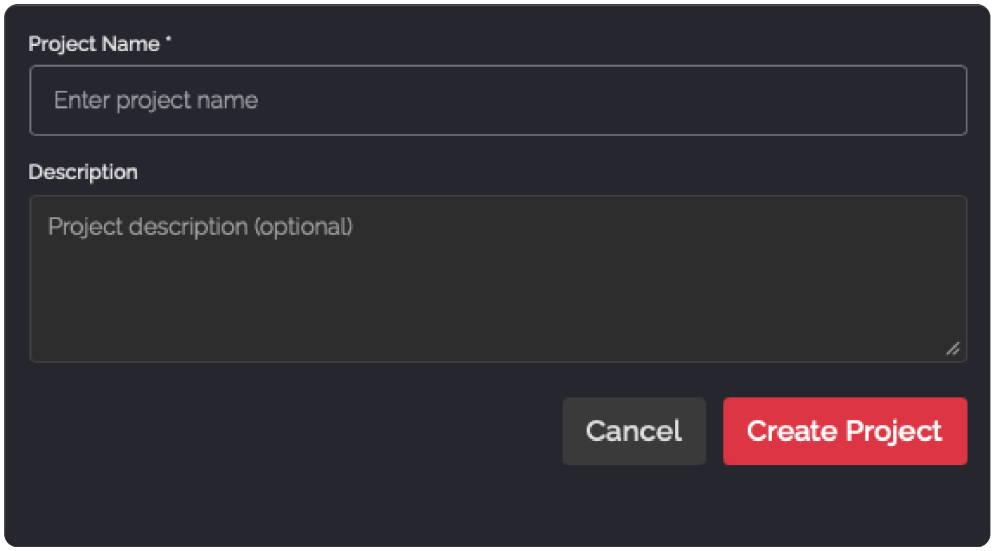


Figure 10. The Add New Project form. Enter a descriptive name and optional description for your project.

After creation, you will be redirected to the **My StraboExperimental Data** where you can begin adding experiments.

Tip: Choose descriptive project names that help you and future researchers identify the research context, such as “Granite Deformation Study 2024” or “High-Temperature Creep Experiments.”

4.2 Viewing Your Projects

The My StraboExperimental Data page displays all your projects:

- Projects are listed with their name last modified timestamp
- Each project lists the experiments by Experiment ID and shows additional information, including:
  - Apparatus Type
  - Test Features
  - Data Entered
  - Last Modified
- Click on a project name to view its details and experiments
- Use the search bar to filter projects by name

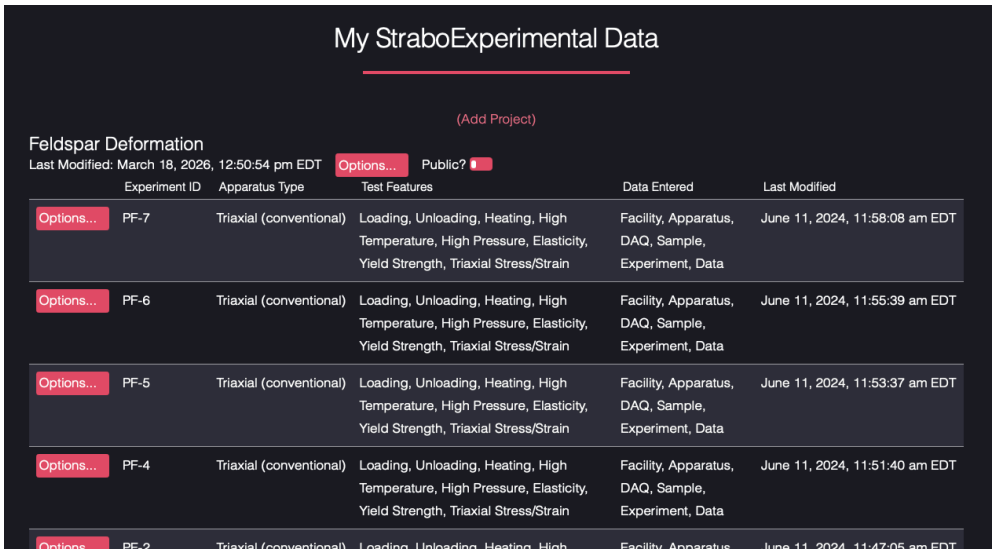


Figure 11. The home page displays all your projects. Click on a project name or the View button to see its details.

4.3 Editing a Project

To modify an existing project:

1. Navigate to the project you want to edit
2. Click the **Edit** button (pencil icon)
3. Update the project name or description
4. Click **Save** to apply changes

Note: Editing a project does not affect the experiments within it.

4.4 Deleting a Project

To delete a project:

1. Navigate to the My StraboExperimental Data page
2. Click the **Options > Delete** button
3. You will be asked to confirm the deletion
4. Click **Confirm Delete** to permanently remove the project

Warning: Deleting a project permanently removes:

- The project itself
- All experiments within the project
- All associated data and metadata

This action cannot be undone. Consider downloading a backup before deleting.

4.5 Project Visibility

Projects can be either private or public:

- **Private** (default): Only you can view and edit the project
- **Public**: Anyone can view the project, but only you can edit it

Making a project public allows other researchers to:

- View your experiment configurations
- Reference your methodology
- Use your setup as a template (via JSON download)
- Discover your work through the search database

4.6 Best Practices for Project Organization

Consider these recommendations when organizing your projects:

- **Group related experiments:** Keep experiments that share similar objectives, samples, or apparatus in the same project
- **Use descriptive names:** Include key identifiers like material type, date range, or research focus
- **Document thoroughly:** Use the description field to capture project context and goals
- **Regular backups:** Periodically download JSON exports of important projects

- **Consider visibility:** Make projects public when appropriate to contribute to the research community

5 Experiments

This section covers the configuration of experiments, including sample documentation, experimental setup, and protocol definition.

Understanding Experiments

An experiment in StraboExperimental represents a complete experimental test, encompassing:

- The sample being tested
- The facility and apparatus used
- The experimental setup and configuration
- The data acquisition system
- The experimental protocol
- The resulting data

Each of these areas is documented in a separate LAPS section, represented by tiles in the experiment editor.

5.1 Creating an Experiment

To create a new experiment:

1. Navigate to a project
2. Click **Options > Add New Experiment**
3. Optionally enter an Experiment ID (auto-generated if left blank)
4. The Experiment home page will open, refer to Figure 12 for an example.
5. Click on each tile to enter data for that section
6. Completed sections will contain a green checkbox, Figure 7

The experiment home page displays six tiles:

1. **Sample** – Material properties and composition
2. **Facility and Apparatus** – Equipment and location
3. **Experimental Setup** – Test configuration
4. **DAQ** – Data acquisition system
5. **Protocol** – Experimental procedures
6. **Data** – Results and datasets

Green checkmarks indicate sections with data. Click any tile to edit that section.

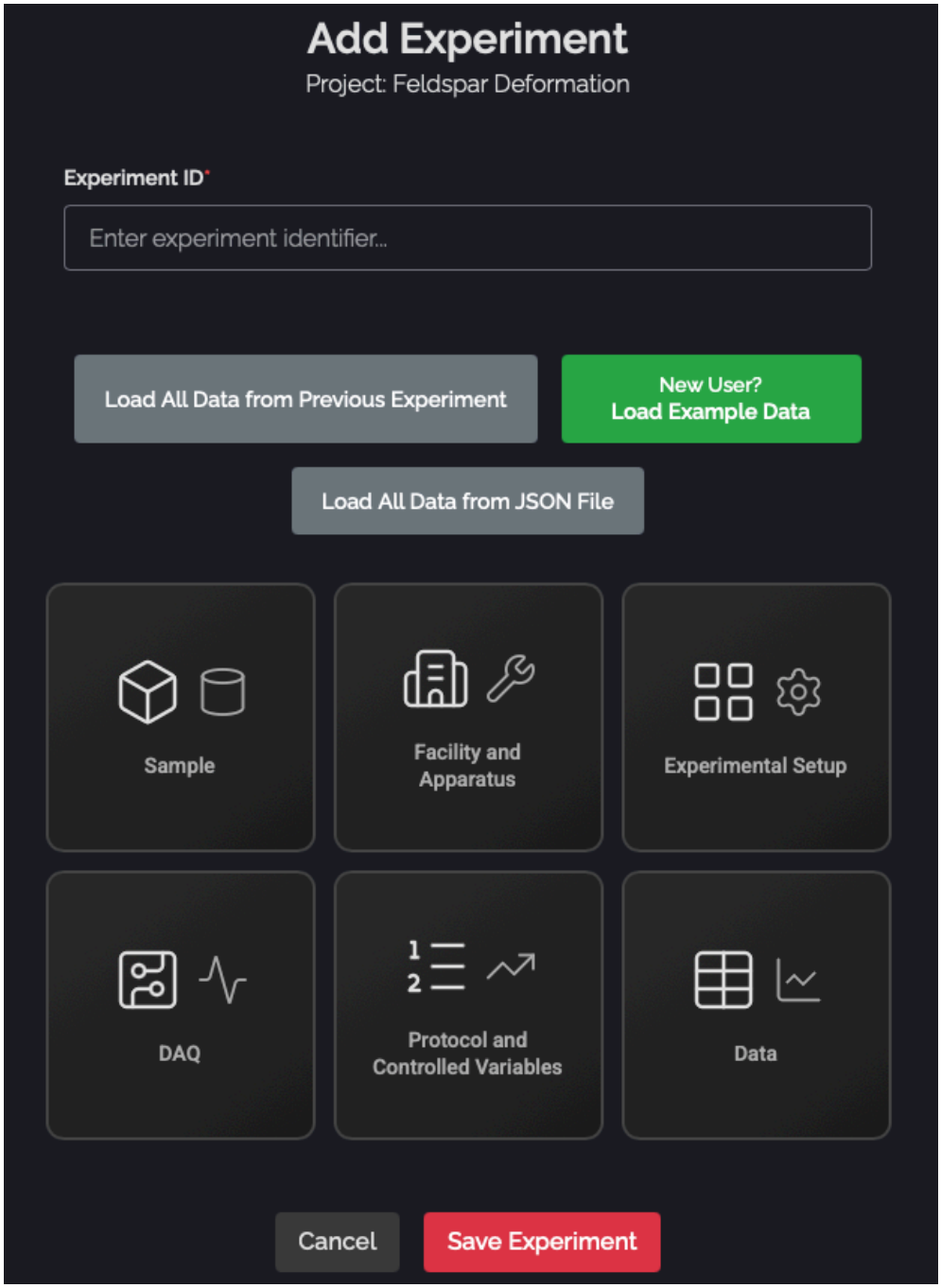


Figure 12. The experiment creation page displays six tiles representing the LAPS data sections.

5.2 Sample Section

The Sample data entry tile documents the material being tested.

5.2.1 Sample Information

- **Sample ID:** Unique identifier for the sample
- **Sample Name:** Descriptive name
- **IGSN:** International Generic Sample Number (if registered)
- **Description:** Detailed description of the sample

Parent Sample

If this sample was derived from another sample:

- **Parent Name:** Name of the source sample
- **Parent IGSN:** IGSN of the source sample
- **Parent ID:** Identifier of the source sample



Figure 13. The Sample Information and Material sections in the Sample Data Entry Tile

5.2.2 Linking to StraboSamples

StraboSamples is the part of the StraboSpot website that gives every physical sample one shared record, used by StraboField, StraboMicro and StraboExperimental. Each saved experiment's sample becomes a StraboSamples record (or joins an existing one), and the record lists every project and experiment that uses the sample. You can see all of your samples at `strabospot.org`, under `My Samples` in the account menu. See the *StraboSamples User Guide* for the full description of the website.

If the sample you tested already exists in StraboSamples (for example, it was collected in StraboField, imaged in StraboMicro, or tested in an earlier experiment), link the experiment to that record instead of typing the sample in again. Typing the same Sample Name or Sample ID does **not** link two samples; only linking does.

1. In the Sample tile, at the top of **SAMPLE INFO**, click **Link Sample From StraboSamples**.
2. The **Link Sample From StraboSamples** window lists your samples from StraboField, StraboMicro and StraboExperimental. Type in the search box (`Search by name, IGSN, or description...`) to narrow the list. Each sample shows how many experiments it is already linked to.
3. Click a sample. The window closes, and the form is filled in from the StraboSamples record: Sample Name, IGSN, Description, location and the parent sample fields. Sample ID is filled in only if it is empty. **Material Type is not filled in**; choose it yourself.
4. Complete the rest of the Sample tile and save the experiment.

Samples that another user has shared with you are grayed out in the list. They cannot be linked from StraboExperimental yet.

The linked sample. Once linked (and for every saved experiment), the top of **SAMPLE INFO** shows `Linked to StraboSamples:` with the sample's name, which opens the sample's page on strabospot.org, and two buttons:

- **Change:** link to a different StraboSamples record.

- **Unlink:** keep the values in the form, but stop using the StraboSamples record. When you save, the experiment's sample becomes a new, separate StraboSamples record. The original record keeps its other links.

Samples managed by StraboField or StraboMicro. If the linked sample also comes from StraboField or StraboMicro, its identity fields (Sample Name, IGSN, Sample ID and Description) are locked in the experiment, and the form shows `identity managed by StraboField` (or `StraboMicro`). Edit them in that application or on the sample's page at strabospot.org. Material, composition, parameters and documents stay editable in the experiment.

Several experiments, one sample. Several experiments can be linked to the same sample, for example repeat runs on one core. A core cut from a larger sample can be recorded on the website as a *child sample* of the original and then linked from the experiment, so the family of samples stays connected.

Edits made on the website. Edits to a sample's name, IGSN, description, location and material type on strabospot.org appear when experiments are viewed on StraboSpot and in their PDFs. The saved experiment itself is not changed.

5.2.3 Material Section

Select the primary material classification:

- **Ceramic**
- **Commodity**
- **EPOS Lithologies**
- **Glass**
- **Ice**
- **Igneous Rock**
- **Metal**
- **Metamorphic Rock**
- **Mineral**
- **Plastic**
- **Sedimentary Rock**
- **Soil**
- **Standards**

Rock Types Organized by category:

Igneous Intrusive:

- Diorite, Gabbro, Granite, Pegmatite, Peridotite, Syenite

Igneous Extrusive:

- Andesite, Basalt, Dacite, Obsidian, Pumice, Rhyolite, Scoria, Tuff

Sedimentary Clastic:

- Breccia, Claystone, Conglomerate, Mudstone, Sandstone, Shale, Siltstone

Sedimentary Chemical:

- Chert, Dolomite, Gypsum, Halite, Limestone, Rock Salt

Metamorphic Foliated:

- Gneiss, Phyllite, Schist, Slate

Metamorphic Non-foliated:

- Amphibolite, Eclogite, Granulite, Hornfels, Marble, Migmatite, Mylonite, Quartzite, Serpentinite, Skarn, Soapstone

5.2.4 Mineralogy

Add specific mineralogy information to the sample. Multiple phases can be added and include a dropdown mineral list, fraction field, grain size field and unit dropdown menu.

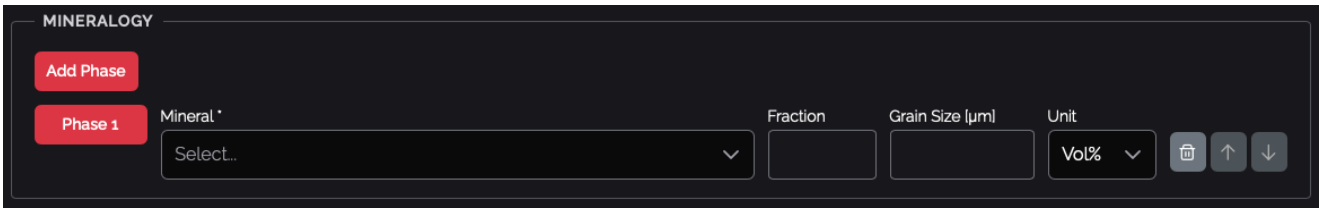


Figure 14. The Mineralogy section of the Sample Data Entry Tile includes user-defined phases with mineral, fraction, grain size, and unit information.

5.2.5 Provenance

Add sample provenance information including formation name, member name, sub-member name, and source (quarry, surface, well).

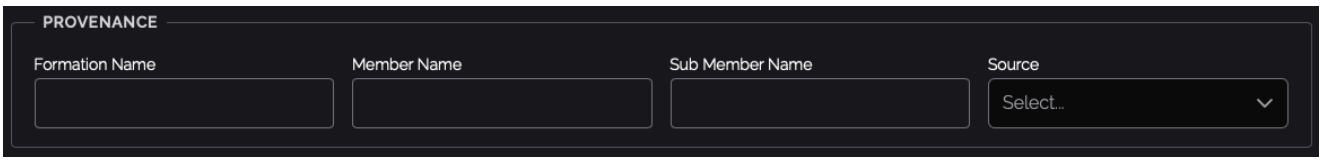


Figure 15. Provenance Section of the Sample Data Entry Tile.

5.2.6 Location

Add sample location information including:

- Street + Number
- Building - Apartment
- Postal Code
- City

- State
- Country
- Latitude
- Longitude

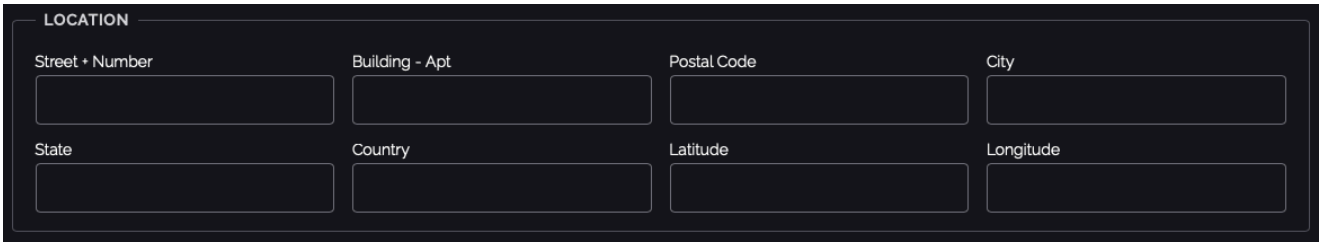


Figure 16. Location Section of the Sample Data Entry Tile.

5.2.7 Texture

Define sample texture using text fields including Bedding, Lineation, Foliation, and Fault.

5.2.8 Parameters

Define sample parameters using the variable dropdown list, value, units, and prefix.

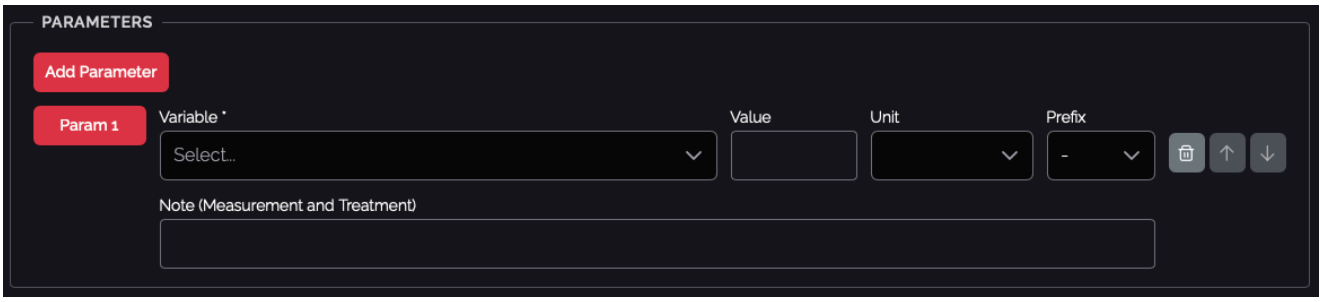


Figure 17. Parameters Section of the Sample Data Entry Tile.

5.2.9 Documents

Add supporting documentation to your Experiment > Sample Data. Upload files and identify the document type, file format, ID, and description.

Document Types: ASTM, Data, Diagram, Manual, Picture, Publication, Software, Video, Other

Document Formats: `.csv`, `.docx`, `.jpg`, `.pdf`, `.png`, `.rar`, `.txt`, `.zip`, other

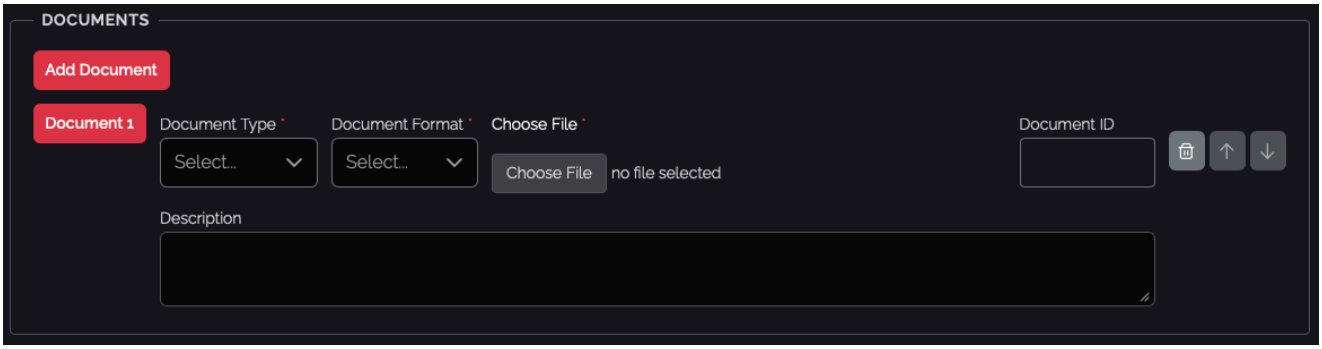


Figure 18. Documents section of the Sample Data Entry Tile.

5.3 Facility and Apparatus Section

5.3.1 Facility Information

The Facility Information section includes:

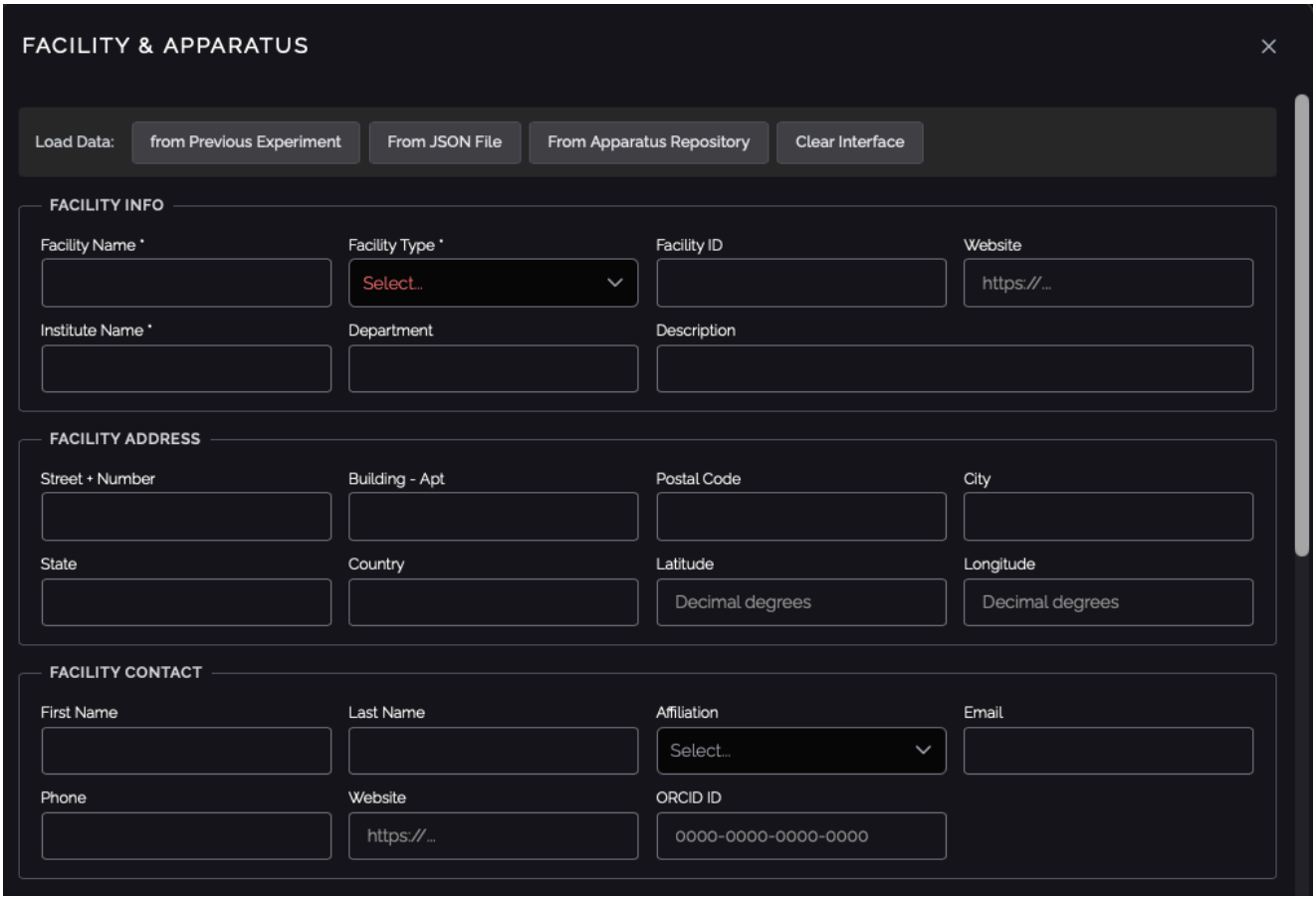


Figure 19. The first half of the Facility and Apparatus data entry module contains sections for facility information, address, and contact.

Required Fields

- **Facility Name:** The name of the laboratory or research group
- **Facility Type:** Select from controlled vocabulary:
  - University Lab

    - Government Facility
    - Private Industry Lab
    - Shared Facility
    - Military
    - Other (specify)
- **Institute Name:** The parent institution (university, organization)

Optional Fields

- **Facility ID:** Internal identifier
- **Department:** Academic department or division
- **Website:** Laboratory website URL
- **Description:** Additional details about the facility

5.3.2 Facility Address

- Street address and building
- Postcode, city, state, country
- Geographic coordinates (latitude, longitude)

5.3.3 Facility Contact

- Contact first and last name
- Affiliation
- Email and phone
- Website and researcher ID (e.g., ORCID)

5.3.4 Apparatus Information

The Apparatus portion of the Facility and Apparatus data entry module contains sections for apparatus information, features, parameters, and documents.

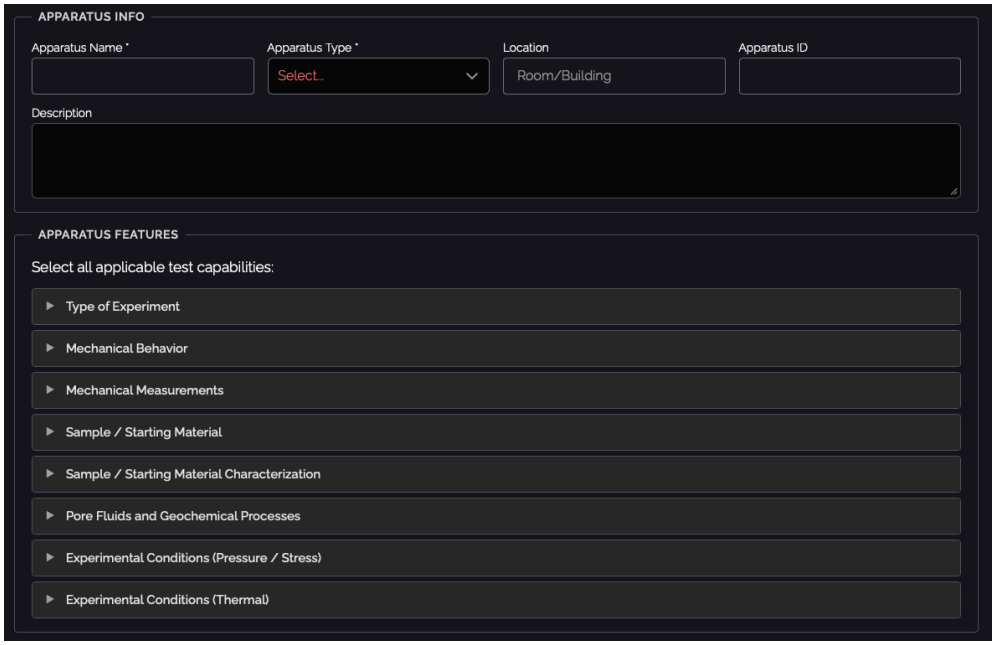


Figure 20. The Apparatus sections capture equipment specifications in Information and Features sections.

Required Fields

- **Apparatus Name:** Descriptive name for the equipment
- **Apparatus Type:** Select from 46 controlled vocabulary types

Apparatus Types

StraboExperimental supports a comprehensive list of apparatus types organized by category:

Uniaxial Systems

- Uniaxial Piston Cylinder
- Monoaxial Press

Triaxial Systems

- Triaxial Vessel
- Triaxial Press
- True Triaxial Apparatus

Shear Systems

- Direct Shear Apparatus
- Rotary Shear Machine
- Biaxial Machine
- Double Direct Shear

High Pressure Systems

- Diamond Anvil Cell
- Multi-Anvil Apparatus
- Piston-Cylinder
- Griggs Apparatus
- Paterson Apparatus

Dynamic/Impact Systems

- Split Hopkinson Bar
- Gas Gun

Micro-Scale Systems

- Nanoindenter
- Atomic Force Microscope

Other Systems

- Creep Apparatus
- Fatigue Tester
- Permeameter
- Hele-Shaw Cell
- And more...

If your apparatus type is not listed, select “Other” and provide a description.

Optional Fields

- **Location:** Room or building within the facility
- **Apparatus ID:** Internal identifier
- **Description:** Technical description of the apparatus

5.3.5 Apparatus Features

Features describe the capabilities of the apparatus using a controlled vocabulary organized into categories.

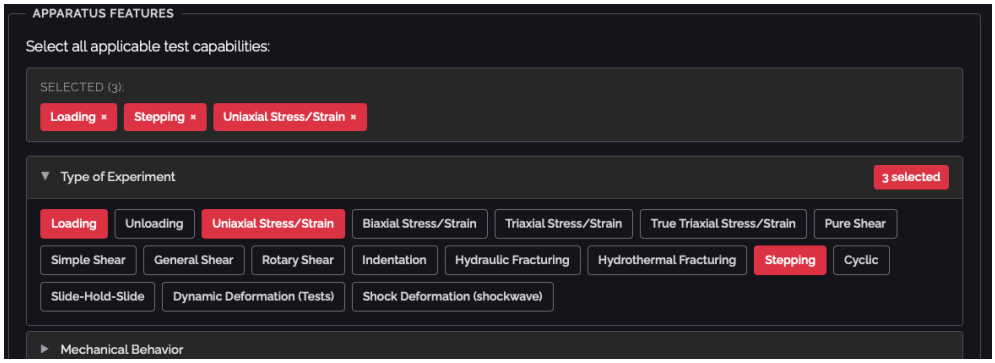


Figure 21. The Feature Selector allows you to document apparatus capabilities across multiple categories.

Using the Feature Selector

1. Click on a category heading to expand it
2. Toggle individual features on or off
3. Selected features appear as pills below the selector
4. Click the “x” on a pill to remove a feature

Apparatus Features

Users can select all applicable test capabilities, see above Section 5.3.5 for instructions on how to add and remove features.

Category & Options	
Type of Experiment	
• Loading • Unloading • Uniaxial Stress/Strain • Biaxial Stress/Strain • Triaxial Stress/Strain • True Triaxial Stress/Strain • Pure Shear • Simple Shear • General Shear	• Rotary Shear • Indentation • Hydraulic Fracturing • Hydrothermal Fracturing • Stepping • Cyclic • Slide-Hold-Slide • Dynamic Deformation (Tests) • Shock Deformation (shockwave)
Mechanical Behavior	

Continued on next page…

(continued)

- Elasticity
- Fracture
- Compaction (Pore Volume Compaction)
- Friction (Frictional Sliding)
- Plastic
- Hardness
- Viscous Deformation
- Creep & Rate dependent deformation
- Brittle-Plastic
- Brittle-Ductile
- Brittle-Viscous

Mechanical Measurements

- Stress
- Strain
- Axial Stress
- Lateral Stress(es)
- Differential Stress
- Strength
- Yield Strength
- Failure Strength
- Flow Strength
- Axial Strain
- Radial Strain
- Lateral Strain(s)
- Shear Strain
- Elastic Moduli
- Acoustic Velocity
- Acoustic Events (AE)
- P-wave Velocity
- S-wave Velocity
- AE Source Location
- (Pore Fluid) Permeability
- Fluid storage capacity
- Steady-state fluid flow (permeability)
- Transient fluid flow (permeability)
- Hydraulic Conductivity
- Resistivity (Electrical Resistivity)
- Conductivity (Electrical Conductivity)
- Electrical Capacitance
- Streaming Potential

Sample / Starting Material

- Single Crystal
- Natural Rock
- Natural Gouge
- Synthetic Gouge
- Sintered
- Gel-synthesized
- Cold Pressed
- HIP Synthesized

Sample / Starting Material Characterization

- Visual
- Optical Microscopy
- Electron Microscopy (SEM, TEM)
- X-ray Diffraction
- EDS or WDS Probe Analyses
- Infrared Spectroscopy
- Raman Spectroscopy
- Tomography
- In-situ X-ray Diffraction
- Other

Pore Fluids and Geochemical Processes

- Pore Fluid
- Permeable fluid flow
- Hydrothermal Reactions
- Mineral Reactions
- Deposition/Evaporation
- Reactive Flow

Continued on next page…

(continued)	
Experimental Conditions (Pressure / Stress)	
• High Pressure • Ultra-high Pressure • Hydrostatic • HIP (Hot Isostatic Pressing) Synthesis • Pore Pressure • Drained/Undrained Pore Fluid	• Pore Fluid Control • Pore Fluid Chemistry • Compression • Extension • Tension • Torsion
Experimental Conditions (Thermal)	
• Heating • Cooling • High Temperature	• Ultra-High Temperature • Low Temperature • Sub-Zero Temperature

5.3.6 Apparatus Parameters

Parameters define the operational limits and specifications of the apparatus.

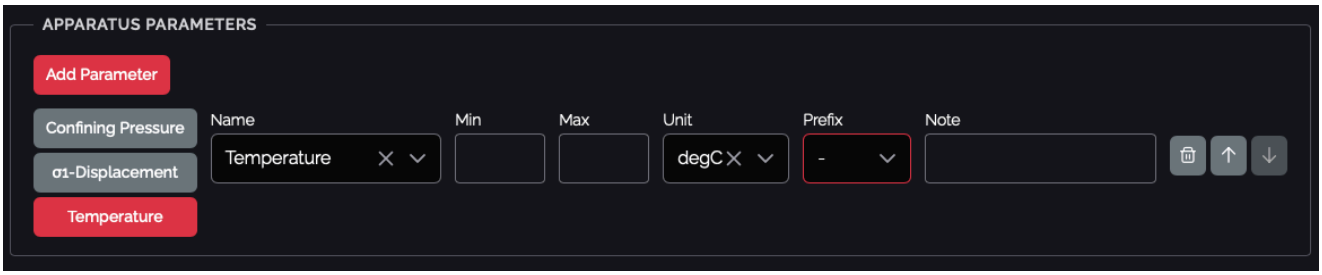


Figure 22. Document apparatus operational limits using the parameter editor.

1. Click **Add Parameter** to add a new row
2. Select the parameter type from the dropdown:
   - Confining Pressure
   - Pore Pressure
   - Axial Stress
   - Temperature
   - Strain Rate
   - Sample Diameter
   - Sample Length
   - Stiffness
   - Permeability
   - Loading Rate
   - Effective Pressure
   - Displacement Rate
   - σ_3 Load
   - σ_3 Displacement
   - σ_2 Load
   - σ_2 Displacement
   - σ_1 Load
   - σ_1 Displacement
3. Enter minimum and maximum values
4. Select the unit and SI prefix
5. Add notes as needed

Parameter Fields

- **Type:** The physical quantity being specified
- **Min:** Minimum operational value
- **Max:** Maximum operational value
- **Unit:** Unit of measurement (Pa, m, K, etc.)
- **Prefix:** SI prefix (milli, kilo, mega, giga, etc.)
- **Note:** Additional context or conditions

5.3.7 Apparatus Documents

Supporting documents can be attached to apparatus records. The Apparatus Documents section could contain technical manuals, calibration certificates, and other supporting documents to apparatus records.

Document Examples

- Technical manuals
- Calibration certificates
- Design drawings
- Photographs
- Schematics
- Data sheets

Uploading Documents

1. Click **Add Document**
2. Click **Choose File** and select the document
3. Enter a description for the document
4. The file will be uploaded and associated with the apparatus

Document Formats

Supported formats include:

- PDF documents
- Images (JPEG, PNG, TIFF)
- Text files
- Spreadsheets

5.4 Experimental Setup Section

The Experimental Setup section documents the test configuration.

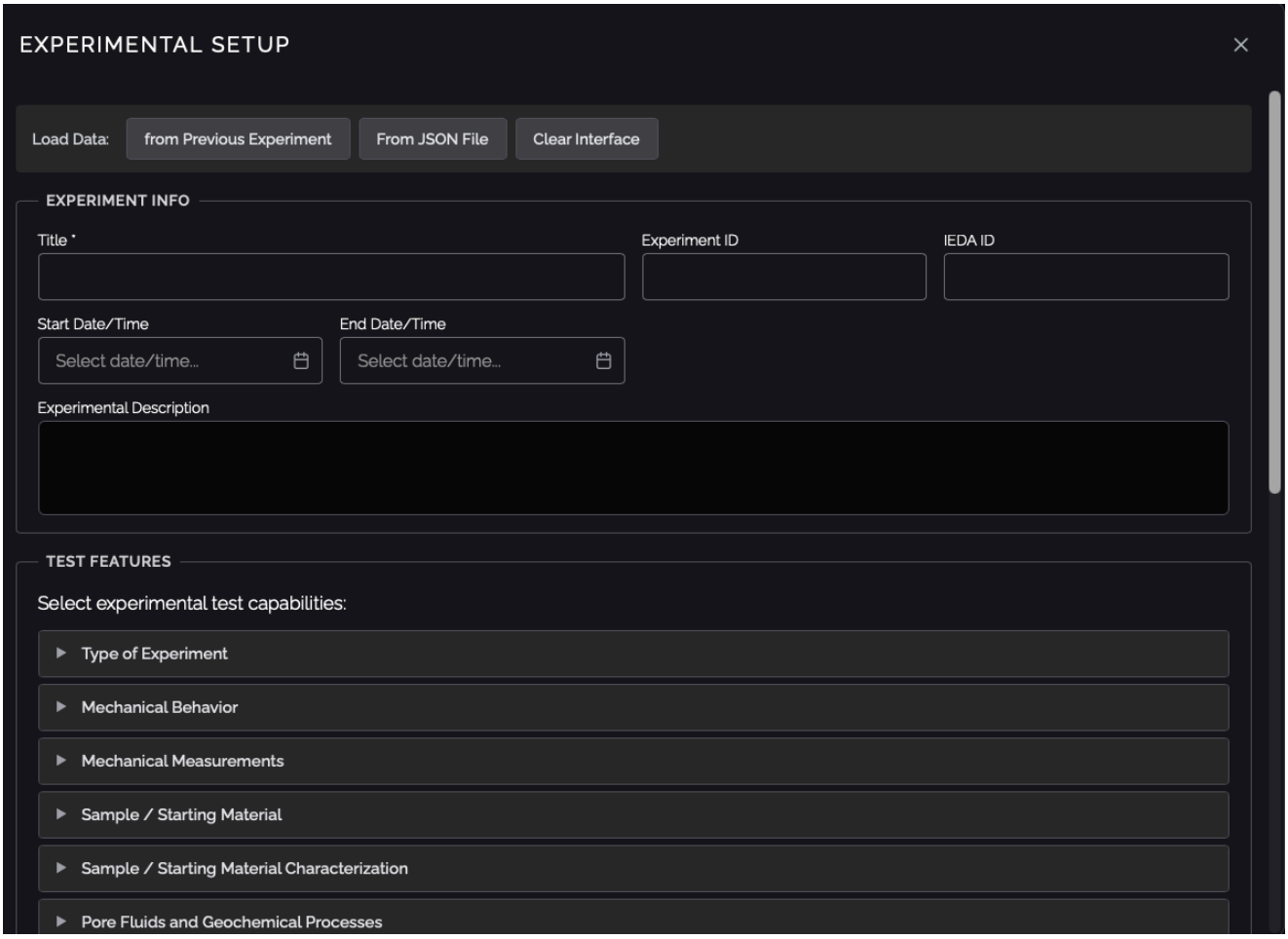


Figure 23. The Experimental Setup section documents the test configuration and assembly.

5.4.1 Experiment Information

- **Experiment Title:** Name of the experiment
- **Experiment ID:** Identifier for the experimental setup
- **IEDA ID:** IEDA Identifier for the experiment
- **Start Date/Time:** Experiment start date and time
- **End Date/Time:** Experiment end date and time
- **Description:** Detailed description of the experimental setup

5.4.2 Test Features

Users can select all applicable experimental setup capabilities, see Section 5.3.5 for instructions on how to add and remove features.

Category & Options
Type of Experiment

Continued on next page...

(continued)

- Loading
- Unloading
- Uniaxial Stress/Strain
- Biaxial Stress/Strain
- Triaxial Stress/Strain
- True Triaxial Stress/Strain
- Pure Shear
- Simple Shear
- General Shear
- Rotary Shear
- Indentation
- Hydraulic Fracturing
- Hydrothermal Fracturing
- Stepping
- Cyclic
- Slide-Hold-Slide
- Dynamic Deformation (Tests)
- Shock Deformation (shockwave)

Mechanical Behavior

- Elasticity
- Fracture
- Compaction (Pore Volume Compaction)
- Friction (Frictional Sliding)
- Plastic
- Hardness
- Viscous Deformation
- Creep & Rate dependent deformation
- Brittle-Plastic
- Brittle-Ductile
- Brittle-Viscous

Mechanical Measurements

- Stress
- Strain
- Axial Stress
- Lateral Stress(es)
- Differential Stress
- Strength
- Yield Strength
- Failure Strength
- Flow Strength
- Axial Strain
- Radial Strain
- Lateral Strain(s)
- Shear Strain
- Elastic Moduli
- Acoustic Velocity
- Acoustic Events (AE)
- P-wave Velocity
- S-wave Velocity
- AE Source Location
- (Pore Fluid) Permeability
- Fluid storage capacity
- Steady-state fluid flow (permeability)
- Transient fluid flow (permeability)
- Hydraulic Conductivity
- Resistivity (Electrical Resistivity)
- Conductivity (Electrical Conductivity)
- Electrical Capacitance
- Streaming Potential

Sample / Starting Material

- Single Crystal
- Natural Rock
- Natural Gouge
- Synthetic Gouge
- Sintered
- Gel-synthesized
- Cold Pressed
- HIP Synthesized

Sample / Starting Material Characterization

Continued on next page…

(continued)	
• Visual • Optical Microscopy • Electron Microscopy (SEM, TEM) • X-ray Diffraction • EDS or WDS Probe Analyses	• Infrared Spectroscopy • Raman Spectroscopy • Tomography • In-situ X-ray Diffraction • Other
Pore Fluids and Geochemical Processes	
• Pore Fluid • Permeable fluid flow • Hydrothermal Reactions	• Mineral Reactions • Deposition/Evaporation • Reactive Flow
Experimental Conditions (Pressure / Stress)	
• High Pressure • Ultra-high Pressure • Hydrostatic • HIP (Hot Isostatic Pressing) Synthesis • Pore Pressure • Drained/Undrained Pore Fluid	• Pore Fluid Control • Pore Fluid Chemistry • Compression • Extension • Tension • Torsion
Experimental Conditions (Thermal)	
• Heating • Cooling • High Temperature	• Ultra-High Temperature • Low Temperature • Sub-Zero Temperature

5.4.3 Author

The dataset Author section in the Experimental Setup data entry tile includes fields for:

- **First Name**
- **Last Name**
- **Affiliation**: Student, Researcher, Lab Manager, Principal Investigator, Technical Associate, Faculty, Professor, Visitor, Service User, External User.
- **Email**
- **Phone**
- **Website**
- **ORCID ID**

5.4.4 Geometry

Add information to describe the sample and/or assemblage geometry. Use the section to add components. **Components are defined by:**

- Number
- **Type**
  - Forcing Block
  - Jacket
  - Sample
  - Spacer
- **Geometry**
  - Circular
  - Cylinder
  - Dogbone
  - Precut
  - Rectangular
  - Split Cylinder
  - Tube
- **Material**
  - standard sample preparation materials like alumina, copper, nickel, platinum, etc.

Components can be further defined by **Dimensions** which allow the user to input component measurements. **Dimensions** are defined by: variable, value, units, prefix and note. **Dimension > Variables**: Bore, Diameter, Diameter, Fault Angle, Height, Length, Span, Wall Thickness, Width.

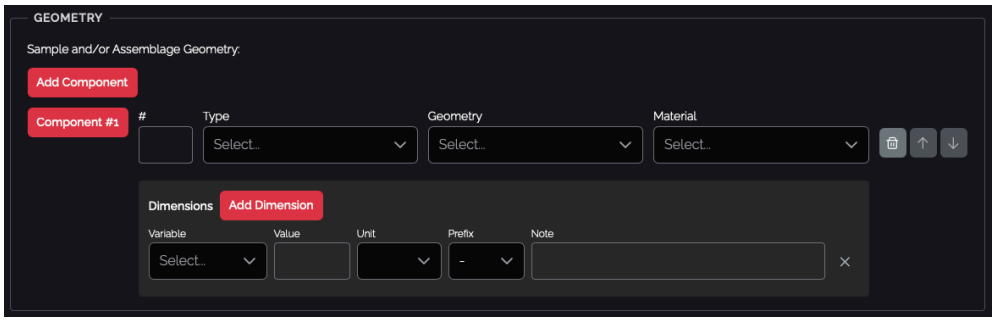


Figure 24. The Geometry section of the data entry tile can be used to explicitly define all experimental setup component geometries.

5.4.5 Documents

Attach supporting documents, for example:

- Assembly diagrams

- Configuration photographs
- Setup notes

Refer to Section 5.2.9 to see complete list of the document section fields and options. Refer to Figure 18 for a screenshot of the section.

5.5 DAQ Section

The DAQ (Data Acquisition System) section defines information, devices, and channels for the data acquisition set up associated with the experiment and apparatus.

In experimental geophysics, the DAQ (Data Acquisition) system is responsible for:

- Converting physical measurements to digital signals
- Recording sensor data at specified sampling rates
- Processing and filtering signals
- Storing time-series data

StraboExperimental provides comprehensive tools for documenting DAQ configurations, including:

- DAQ system specifications
- Individual channel configurations
- Sensor/actuator details
- Calibration information

For laboratories with standardized DAQ configurations:

1. Create a template experiment with your standard DAQ setup
2. Document all channels completely
3. Export the experiment as JSON
4. Use as a starting point for new experiments

This ensures:

- Consistent documentation across experiments
- Reduced data entry time
- Standardized header nomenclature
- Complete calibration records

5.5.1 DAQ Info

- **DAQ Group Name:** Name of the acquisition system assembly
- **DAQ Type:** Conventional, Proprietary, Standard
- **Location:** Location of the DAQ System

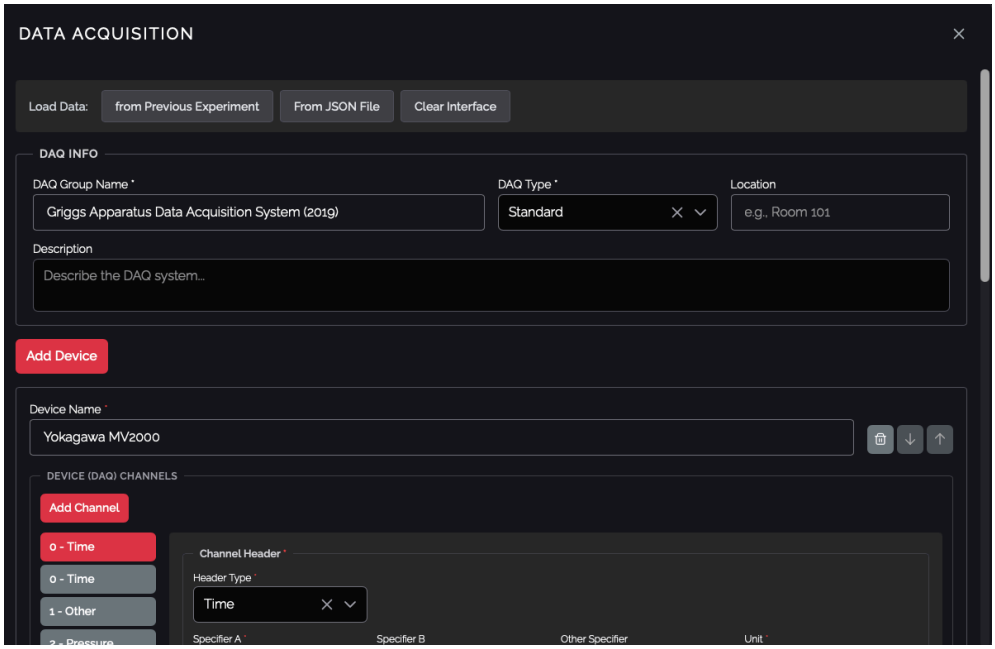


Figure 25. The DAQ (Data Acquisition System) section allows users to detail the devices and channels used in the experiment.

- **Description:** Detailed description of the DAQ system

5.5.2 Devices

Add a device to the Data Acquisition system, see Figure 26 for a screenshot of the initial input form. Enter the device name, add channels and supporting documentation.

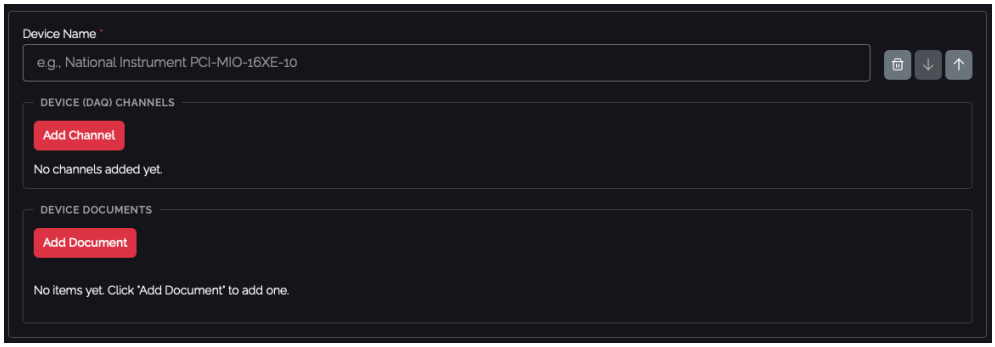


Figure 26. The DAQ (data acquisition) device input.

Device Channels

1. In the DAQ section, click **Add Channel**
2. A new channel editor will appear
3. Complete the four subsections: Header, Information, Sensor/Actuator, Calibration
4. Add additional channels as needed

The **Data Acquisition** module allows users to define and document individual sensor channels associated with an experimental apparatus. Channels are added incrementally via the *Add Channel* button, with each channel configured through three subsections.

Channel Header

The channel header establishes the identity and physical quantity being recorded. The **Header Type** dropdown categorizes the measured variable (e.g., force, displacement, pressure). **Specifier A** and **Specifier B** provide primary and secondary descriptors for the channel (e.g., axial, radial), while **Other Specifier** accommodates any additional classification. The **Unit** field records the engineering unit of the output signal (e.g., MPa, mm, V).

- **Header Type** (required): The physical quantity being measured
  - Time
  - Temperature
  - Pressure
  - Strain
  - Displacement
  - Stress
  - Load
  - Electrical
  - Chemistry
  - Other
- **Specifier A** (required): Context for the measurement
  - Sample, Room, Furnace, Confining, Pore, etc.
  - Options change based on Header Type
- **Specifier B:** Additional location detail
  - Top, Bottom, Average, Internal, External, etc.
- **Other Specifier:** Free text for custom descriptions
- **Unit** (required): Measurement unit
  - Options filtered by Header Type
  - SI units and common alternatives provided

Channel Information

This subsection captures the technical acquisition parameters for the channel. The **Channel #** dropdown assigns the physical or logical channel index on the DAQ hardware. **Type** and **Configuration** describe the signal type and wiring scheme (e.g., differential, single-ended), and a free-text **Note** field accommodates any relevant remarks. Analog recording parameters include **Res (bit)**, the bit-depth resolution of the digitizer; **Min** and **Max**, the expected signal range; **Rate**, the sampling frequency (e.g., 1 kHz); **Filter**, any anti-aliasing or smoothing filter applied; and **Gain**, the amplification factor applied to the raw signal.

- **Channel Number:** 1-64

- **Type:**
  - Analog Input
  - Analog Output
  - Digital Input
  - Digital Output
  - System Clock
  - System Data
  - Calculated
- **Configuration:**
  - Single-ended
  - Differential
  - RSE (Referenced Single-Ended)
  - Pseudo-differential
  - Serial
  - Single
  - System
  - Line
  - Parallel
- **Note:** Additional channel notes
- **Resolution:** Bits of resolution (e.g., 12, 16, 24)
- **Range Min/Max:** Input voltage or signal range
- **Rate:** Sampling rate (samples per second)
- **Filter:** Filter settings if applicable
- **Gain:** Amplifier gain setting
  - 1x, 2x, 4x, 8x, 16x, 32x, 64x, 128x

Sensor/Actuator Information

This subsection identifies the physical transducer or actuator associated with the channel. The **Sensor/Actuator** dropdown selects from previously defined instruments, and the **IEEE Sensor Template** field links to a standardized sensor description where applicable. **Type** classifies the device (e.g., load cell, LVDT, pressure transducer). Device provenance is documented through **Manufacturer ID**, **Model #**, **Version Letter**, **Version #**, and **Serial #**, providing a complete hardware record for reproducibility and audit purposes.

Details about the sensor or actuator connected to the channel:

- **Sensor/Actuator Type:** Select from 67 types including:
  - Accelerometer
  - Acoustic Emission Sensor
  - Capacitance Sensor
  - Diaphragm Gauge
  - Displacement Transducer
  - Encoder
  - Force Transducer
  - Laser Interferometer
  - Load Cell
  - LVDT
  - Piezoelectric Sensor
  - Pressure Transducer
  - Strain Gauge
  - Thermocouple
  - And many more...
- **IEEE Sensor Template:** Standard sensor templates
  - Force, Displacement, Temperature, Pressure, etc.
- **Active/Passive Type:** Sensor power classification
- **Manufacturer ID:** Sensor manufacturer
- **Model Number:** Sensor model
- **Version Letter/Number:** Firmware or hardware version
- **Serial Number:** Unique sensor identifier

Calibration Information

The calibration subsection records how raw sensor output is converted to calibrated engineering units. Data may be entered in one of several formats, selected via the **Template** dropdown:

- **Calibration Table** — paired input/unit values defining a lookup table;
- **Linear Regression 1** — a first-order relationship of the form Input $\times\ \mathrm{a}_0$: Input/Unit;
- **Linear Regression 2** — a second-order polynomial $\mathrm{u} = (\mathrm{x} \cdot \mathrm{a}_0 + \mathrm{a}_1)^{\mathrm{a}_2} + \mathrm{a}_3$;
- **Polynomial** — a base/exponent polynomial form;
- **Frequency Response Table** — paired frequency/amplitude values for dynamic sensors.

The **Input** and **Unit** dropdowns define the raw input quantity and its calibrated output unit, and **Excitation** records the supply voltage or current applied to the sensor. A **Date** field logs when the calibration was performed, and a **Note** field (e.g., "100 kN max") captures any relevant limitations or comments. Calibration data points are entered via the *Add Data* button.

- **Template:** Calibration method
  - Calibration Table
  - Linear Regression
  - Polynomial

    - Frequency Response Table
- **Input/Unit:** Calibration input specifications
- **Excitation:** Excitation voltage or current
- **Calibration Date:** When calibration was performed
- **Note:** Calibration notes
- **Data Points:** Calibration table entries
    - Add rows with A (input) and B (output) values

5.5.3 Managing Channels

- Use up/down arrows to reorder channels
- Click delete icon to remove a channel
- Expand/collapse channels to manage complexity

Device Documents

In addition to the documents section for the entire DAQ (Data Acquisition) Section, the Devices Section also has a documents section. Documents can be added and associated with specific devices.

- Refer to Section 5.2.9 to see complete list of the document section fields and options.
- Refer to Figure 18 for a screenshot of the section.
- Refer the Section 5.5.4 for examples of DAQ system supporting documentation.

5.5.4 Documents

Refer to Section 5.2.9 to see complete list of the document section fields and options. Refer to Figure 18 for a screenshot of the section.

Attach supporting documents, for example:

- **Sensor Calibration Certificates:** Records confirming that load cells, strain gauges, LVDTs (linear variable differential transformers), or pore pressure transducers have been calibrated against traceable standards. These typically include the calibration date, coefficients, linearity error, and the certifying lab.
- **Channel Configuration / Wiring Diagrams:** Documentation mapping each physical sensor to its DAQ channel, including gain settings, excitation voltage, sampling rate, filter cutoffs, and engineering unit conversions.
- **DAQ System Metadata / Acquisition Parameter Logs:** A record of the software and hardware settings used during the experiment, such as the NI LabVIEW or similar acquisition software version, scan rate (e.g., 1 Hz for slow creep vs. 1 MHz for dynamic fracture), triggering thresholds (particularly for acoustic emission systems), and any real-time processing applied (e.g., moving averages, tare offsets).

5.6 Protocol and Controlled Variables Section

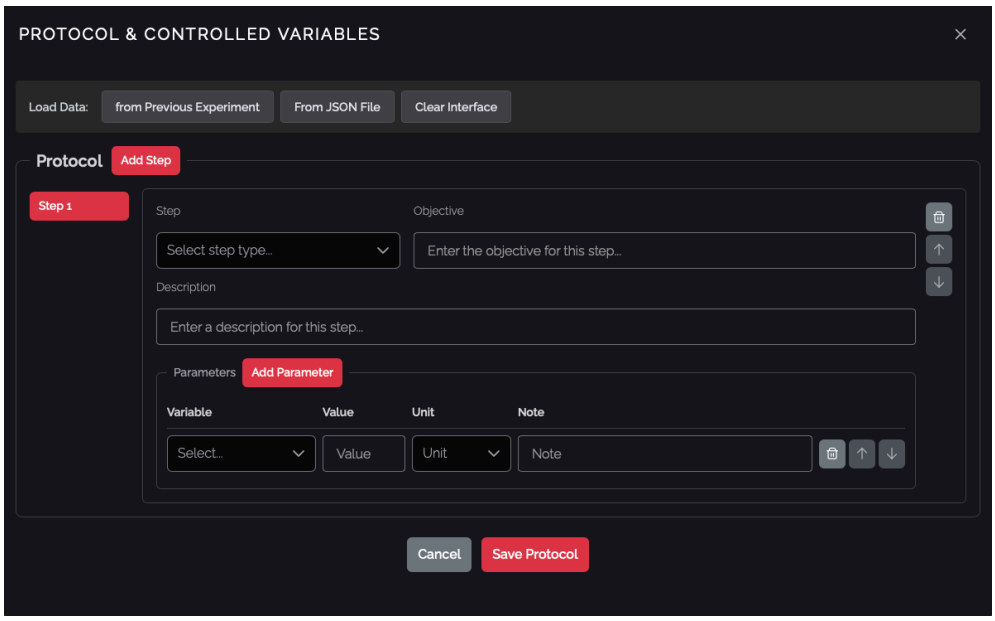


Figure 27. The Protocol form allows you to define step-by-step experimental procedures with controlled variables.

The **Protocol & Controlled Variables** module allows users to define the sequential experimental procedure and document the controlled conditions maintained at each stage. Previously defined protocols may be imported using the *Load Data* options at the top of the interface: **from Previous Experiment**, which populates the form from an existing database entry; **From JSON File**, which imports a locally stored protocol definition; or **Clear Interface**, which resets all fields.

5.6.1 Protocol Steps

The experimental protocol is organized as an ordered sequence of steps, added via the *Add Step* button. Each step is listed in the left panel and may be reordered or deleted using the controls adjacent to the step entry. Each step contains the following fields:

- **Step** — a dropdown specifying the step type;
  - Loading
  - Unloading
  - Heating
  - High Temperature
  - High Pressure
  - Elasticity
  - Yield Strength
  - Triaxial Stress/Strain
- **Objective** — a free-text field describing the scientific or procedural goal of the step;

- **Description** — a longer free-text field for detailed notes on how the step is to be executed.

5.6.2 Parameters

Each step may have one or more controlled variables defined under the **Parameters** subsection, added via the *Add Parameter* button. Each parameter row contains four fields:

- **Variable** — a dropdown identifying the controlled quantity (e.g., confining pressure, strain rate, temperature, pore fluid pressure);
- **Value** — the target or nominal value held constant during the step;
- **Unit** — a dropdown specifying the physical unit of the variable (e.g., MPa, °C, µm/s);
- **Note** — a free-text field for any clarifying remarks, such as tolerance ranges or ramp rates.

Parameter rows may be reordered or removed using the up/down and delete buttons at the right of each row. Once all steps and parameters are defined, the protocol is committed to the record using the *Save Protocol* button.

5.7 Data Section

The **Data** module is used to upload and describe the experimental datasets associated with a record. As with the Protocol module, existing data configurations may be imported via **from Previous Experiment** or **From JSON File**, or the interface may be reset using **Clear Interface**.

5.7.1 Datasets

One or more datasets may be added using the *Add Dataset* button, with each dataset listed in the left panel and reorderable via the adjacent controls. Each dataset entry contains the following fields:

- **Data** — a dropdown classifying the dataset type (e.g., Time Series);
- **Data Type** — specifies the nature of the content (e.g., Data, Picture, Software, Video, Other);
- **File Uploaded** — displays the filename of the attached data file, with an option to delete and replace it; accepted formats include common tabular types such as `.csv` and `.xls`;
- **Data ID** — an optional free-text identifier for referencing the dataset within the record;
- **File Format** — a dropdown indicating the file format of the uploaded data (e.g., csv, xls, txt);
- **Data Quality** — a dropdown assessment of the overall dataset quality (e.g., Good, Acceptable, Poor);
- **Description** — a free-text field for any relevant notes about the dataset, such as processing history or known artifacts.

5.7.2 Data Headers

Each dataset contains a **Data Headers** subsection that defines the column structure of the uploaded file. Headers are added via the *Add Header* button and listed in the left panel, where they can be reordered or deleted. Each header entry includes the following fields:

- **Header** — a dropdown identifying the physical quantity represented by the column (e.g., Time, Pressure, Displacement, Temperature);
- **Specifier A** and **Specifier B** — dropdowns providing primary and secondary qualifiers for the header (e.g., Absolute, Total);
- **Other Specifier** — a free-text field for any additional classification not covered by the standard specifiers (e.g., Date);
- **Unit** — a dropdown specifying the unit of the column values (e.g., MPa, mm, °C, dd-mm-yyyy);
- **Type** — identifies the source or nature of the channel (e.g., System Clock, Analog Input);
- **Channel #** — links the header to the corresponding DAQ channel index defined in the Data Acquisition module;
- **Data Quality** — a per-column quality flag (e.g., Acceptable, Good, Poor), allowing individual columns to be flagged independently of the dataset-level assessment;
- **Notes** — a free-text field for column-specific remarks.

5.8 Editing Experiments

To edit an existing experiment:

1. Navigate to the project containing the experiment
2. Click **Options> Edit** next to the experiment
3. Modify any section by clicking on its tile
4. Changes are saved when you navigate between sections

5.9 Viewing Experiments

To view an experiment in read-only mode:

1. Navigate to the project containing the experiment
2. Click **Options > View** next to the experiment
3. Browse through sections to see configured data
4. No changes can be made in view mode

5.10 Deleting Experiments

To delete an experiment:

1. Navigate to the project containing the experiment
2. Click **Delete** next to the experiment
3. Confirm the deletion when prompted

Warning: Deleting an experiment permanently removes all associated data. This action cannot be undone.

5.11 Loading Data from Previous Experiments

To speed up data entry, you can copy data from existing experiments:

5.11.1 Load All Data

1. In the experiment edit view, click **Load All Data from Previous Experiment**
2. Select the source experiment from your list
3. All sections will be populated with data from the selected experiment
4. Modify as needed for your new experiment

5.11.2 Load Section Data

1. Navigate to the specific section
2. Click **From Previous Experiment** in the section load bar
3. Select the source experiment
4. Only that section's data will be loaded

Note: Loading data overwrites existing data in the target sections. Confirm before loading if you have unsaved changes.

5.12 Best Practices

- **Complete all sections:** Thorough documentation improves reproducibility
- **Use consistent identifiers:** Maintain naming conventions across experiments
- **Document deviations:** Note any departures from standard procedures
- **Attach supporting documents:** Include photos, diagrams, and notes
- **Use templates:** Load from previous experiments to ensure consistency

6 Facility and Apparatus Management

This section covers the documentation of research facilities and experimental apparatus, including the public Apparatus Repository.

In the LAPS schema:

- A **Facility** represents a research institution, laboratory, or research group where experiments are conducted
- An **Apparatus** is a piece of experimental equipment within a facility
- Each facility can have multiple apparatus
- Apparatus documentation includes capabilities, parameters, and supporting documents

6.1 The Apparatus Repository

The Apparatus Repository is a publicly accessible directory of experimental equipment used in rock physics and related fields.

6.1.1 Accessing the Repository

To browse the Apparatus Repository:

1. From the StraboExperimental home page, click **Apparatus Repository**
2. Browse the list of facilities and their associated apparatus
3. Click on a facility to expand and view its equipment
4. Click on an apparatus to view detailed specifications

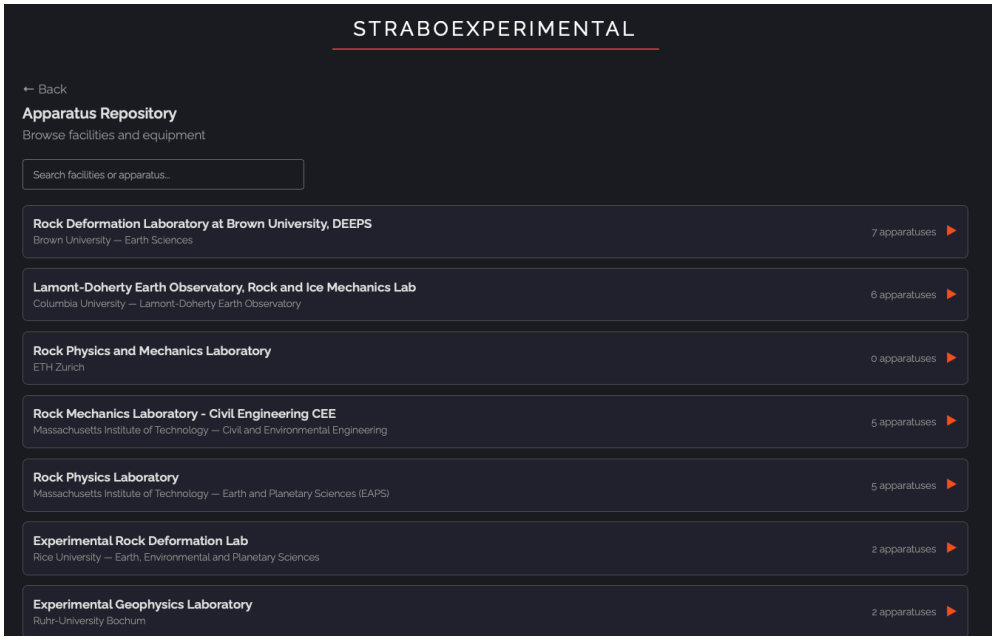


Figure 28. The Apparatus Repository displays facilities as expandable cards. Click to view associated apparatus.

6.1.2 Using Repository Data

When configuring experiments, you can import apparatus data from the repository:

1. In the Facility and Apparatus section of an experiment
2. Click **From Apparatus Repository** in the load bar
3. Browse and select the desired apparatus
4. The facility and apparatus data will be populated in your experiment

6.1.3 Becoming a Facility Manager

1. Contact the StraboSpot team to request facility manager permissions
2. Provide information about your laboratory and institution
3. Once approved, your facility will be created and you can add apparatuses to the repository

6.1.4 Adding Apparatus to a Facility

1. Navigate to your facility in the repository
2. Click **Add Apparatus**
3. Complete the apparatus form with specifications
4. Add features, parameters, and documents
5. Click **Save** to publish the apparatus

Best Practices

- Provide clear, accurate descriptions
- Include operational limits and capabilities
- Upload relevant documentation
- Keep information up to date
- Respond to inquiries from other researchers

7 Import/Download and Data Sharing

This section covers data import, download, and sharing capabilities in StraboExperimental.

7.1 Download Formats

StraboExperimental supports two primary download formats:

7.1.1 JSON Download

JSON (JavaScript Object Notation) is the native data format for StraboExperimental. Downloaded JSON files:

- Contain complete metadata following the LAPS schema
- Are human-readable and editable
- Can be re-imported to create new experiments
- Are compatible with external tools and scripts
- Preserve all data relationships and structures

7.1.2 PDF Download

PDF download generates formatted reports suitable for:

- Documentation and archiving
- Sharing with collaborators
- Publication supplements
- Presentation materials

PDF reports include all configured metadata in a readable format.

7.2 Downloading Projects

To download a complete project:

1. Navigate to the project view
2. Click the **Options > Download** button
3. Select the desired format (JSON or PDF)
4. Choose to save to disk or copy to clipboard (JSON only)

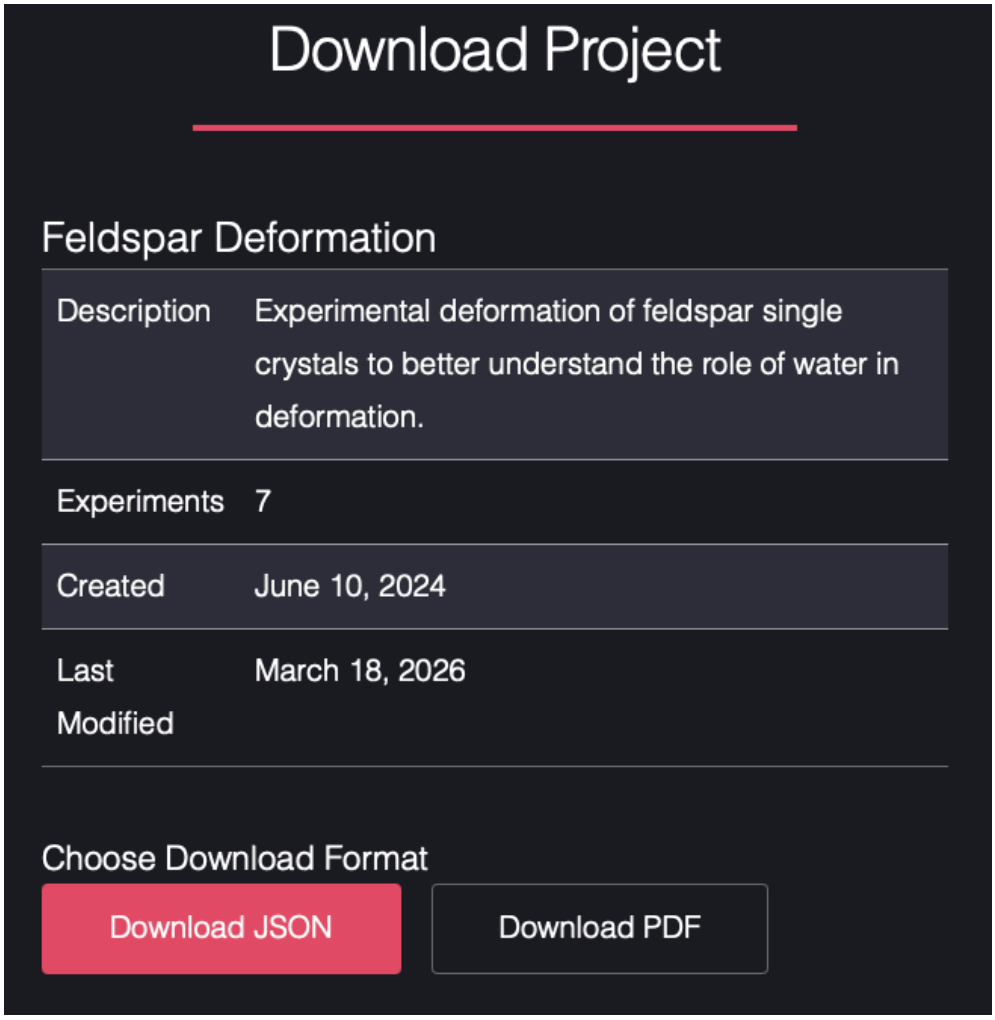


Figure 29. The download modal offers multiple export options for projects and experiments.

Project exports include:

- Project name and description
- All experiments within the project
- Complete metadata for each experiment section

7.3 Downloading Experiments

To download a single experiment:

1. Navigate to the experiment view
2. Click the **Options > Download** button
3. Select the desired format
4. The experiment data will be downloaded

7.4 Importing Data

StraboExperimental supports importing data from JSON files.

7.4.1 Import from JSON File

To import experiment data:

1. Create a new experiment or edit an existing one
2. Click **Load All Data from JSON File** in the bulk load bar
3. Select the JSON file from your computer
4. The experiment fields will be populated from the file

Note: Only valid JSON files conforming to the LAPS schema can be imported. Files must maintain the correct structure and field names.

7.4.2 Import Section Data

To import data for a specific section:

1. Navigate to the desired section (Sample, DAQ, etc.)
2. Click **From JSON File** in the section load bar
3. Select the JSON file
4. Only that section's data will be loaded

7.4.3 Load from Previous Experiment

1. Click **Load All Data from Previous Experiment**
2. Browse your experiments grouped by project
3. Select the source experiment
4. All sections will be populated

This copies:

- All metadata from the selected experiment
- References to documents (not the files themselves)
- DAQ channel configurations
- Protocol definitions

7.4.4 Load Example Data

For new users (available only when creating experiments):

1. Click **New User? Load Example Data**
2. Sample data will be loaded into all sections
3. Explore the interface to understand data structures
4. Replace example data with your own

7.5 Using Templates

JSON exports can be used as templates for new experiments.

7.5.1 Creating a Template

1. Configure an experiment with typical settings for your apparatus
2. Complete all sections that remain constant across experiments
3. Export the experiment as JSON
4. Save the file as a template

7.5.2 Using a Template

1. Create a new experiment
2. Load the template JSON file
3. Modify experiment-specific values:
    - Sample information (name, ID, properties)
    - Experiment dates and identifiers
    - Data file references
    - Any values that changed
4. Save the experiment

Templates are particularly useful for:

- Repeated experiments with the same apparatus
- Series of tests on similar samples
- Standardizing laboratory documentation
- Training new researchers

7.6 Editing JSON Files

Exported JSON files can be edited manually:

7.6.1 When to Edit JSON

- Batch updates to multiple experiments
- Programmatic data entry
- Correcting systematic errors
- Migrating data from other systems

7.6.2 Best Practices

- Always validate JSON syntax before import
- Preserve the schema structure
- Use a JSON-aware editor with syntax highlighting
- Keep backups of original files
- Test imports with a single experiment first

7.6.3 JSON Structure Overview

```
{
  "experiment_id": "...",
  "sample": { ... },
  "facility": { ... },
  "apparatus": { ... },
  "experimental_setup": { ... },
  "daq": { ... },
  "protocol": { ... },
  "data": { ... }
}
```

7.7 Data Sharing

StraboExperimental supports several approaches to data sharing.

7.7.1 Public Projects

Making a project public allows:

- Other users to view your experiments
- Search discovery through the database
- Reference in publications
- Download of metadata (not raw data files)

7.7.2 JSON File Sharing

Share data with collaborators by:

1. Exporting experiments as JSON
2. Sending files via email or file sharing services
3. Collaborators import the JSON to their accounts

7.7.3 API Access

For programmatic access:

- StraboExperimental provides a REST API
- Public projects are accessible via API
- Supports automated data retrieval
- Enables integration with analysis tools

7.8 Data Storage

Understanding data storage in StraboExperimental:

7.8.1 Metadata Storage

- All metadata is stored on StraboSpot servers
- Data is associated with your user account
- Automatic saving occurs as you work
- Storage overhead is minimal (typically less than 1 MB per experiment)

7.8.2 Document Storage

- Uploaded documents are stored on the server
- Files are associated with specific records
- Documents can be viewed or downloaded
- Consider storage limitations for large files

7.8.3 Data File References

- Data files can be uploaded and referenced
- Large datasets may be stored externally
- Reference external storage locations in metadata
- Document file locations for reproducibility

7.9 Searching the Database

To find public projects:

1. Navigate to the Search Database feature
2. Enter keywords related to your search (apparatus type, material, technique)
3. Browse the results to find relevant experiments

4. View project details to understand experimental setups

Search functionality covers all public projects across the StraboSpot ecosystem, including field, microstructural, and experimental data.

8 Troubleshooting and FAQ

This section addresses potential issues and frequently asked questions about StraboExperimental.

Login Problems

Cannot log in

- Verify your email address is correct
- Check that Caps Lock is not enabled
- Use the “Forgot Password” feature if needed
- Ensure your account has been verified
- Try clearing browser cookies and cache

Session expired

- Extended inactivity causes automatic logout
- Log in again to continue working
- Your data is saved automatically, so no work should be lost

Data Entry Issues

Form fields not saving

- Ensure you have a stable internet connection
- Navigate to another section to trigger auto-save
- Check for validation errors (marked in red)
- Try refreshing the page and re-entering data

Required field errors

- Required fields are marked with an asterisk (*)
- Complete all required fields before saving
- Check dropdown selections are valid

Dropdown not showing expected options

- Type to filter the dropdown list
- Select “Other” and enter custom value if needed
- Check if conditional fields need to be triggered first

File Upload Issues

Document upload fails

- Check file size limits (contact administrator for limits)
- Verify the file format is supported
- Try a different browser
- Check your internet connection stability

Cannot view uploaded document

- Ensure pop-ups are not blocked
- Try right-clicking and opening in new tab
- Download the file and open locally

Import/Export Issues

JSON import fails

- Validate JSON syntax using an online validator
- Ensure the file follows the LAPS schema structure
- Check for special characters that may cause parsing errors
- Try importing a smaller subset of data

PDF export not working

- Allow pop-ups from strabospot.org
- Check browser download settings
- Try a different browser
- Wait for the export to complete before navigating away

8.1 Frequently Asked Questions

What is StraboExperimental? StraboExperimental is a web application for managing and archiving experimental geophysical data, particularly rock deformation experiments. It is part of the StraboSpot ecosystem and implements the LAPS (Laboratory Apparatus and Protocol Schema) standard.

Is StraboExperimental free to use? Yes, StraboExperimental is open-source, publicly funded, and free to use. It is supported by the National Science Foundation and the experimental geophysics community.

Do I need to install any software? No, StraboExperimental is a web application that runs in your browser. You only need a modern web browser and an internet connection.

Can I use StraboExperimental offline? No, StraboExperimental requires an internet connection as all data is stored on the StraboSpot servers.

Account Questions

How do I create an account? Visit `https://strabospot.org` and click "Register." Complete the registration form with your email, password, and institutional information.

Can I use the same account for other StraboSpot applications? Yes, your StraboSpot account provides access to StraboField, StraboMicro, and StraboExperimental.

How do I reset my password? Click "Forgot Password" on the login page and follow the instructions sent to your email.

Data Questions

Who can see my data? By default, your projects are private and only visible to you. You can make projects public to share with the community.

Can I delete my data? Yes, you can delete individual experiments or entire projects. Deletion is permanent and cannot be undone.

Is my data backed up? StraboSpot servers maintain regular backups. However, we recommend keeping your own JSON exports of important data.

What happens to my data if I delete my account? Contact the StraboSpot team to discuss account deletion. Associated data may be retained for scientific record keeping.

Feature Questions

What is the Apparatus Repository? The Apparatus Repository is a public directory of experimental equipment across institutions. It allows researchers to discover equipment and use standardized apparatus descriptions.

Can I add my equipment to the Apparatus Repository? Yes, laboratory managers can contribute to the repository. Contact the StraboSpot team to request facility manager permissions.

What file formats are supported for data upload? Common formats include CSV, JSON, HDF5, and various text formats. See Section 5.7 for details.

Can I export my data to use in other software? Yes, JSON exports contain complete metadata that can be processed by external tools. Data files can be downloaded in their original formats.

8.1.1 Technical Questions

What browsers are supported? StraboExperimental works best with Google Chrome. Firefox, Edge, and Safari are also supported.

Why does the application look different from screenshots in this manual? The interface may be updated periodically. Core functionality remains consistent, but visual elements may change.

Is there an API for programmatic access? Yes, StraboExperimental provides a REST API for automated data access. Contact the StraboSpot team for documentation.

8.1.2 LAPS Schema Questions

What is LAPS? LAPS (Laboratory Apparatus and Protocol Schema) is a standardized data schema for documenting experimental geophysical data. It was developed collaboratively by MIT CORD and the StraboSpot team.

Do I need to understand LAPS to use StraboExperimental? No, the application guides you through data entry. Understanding LAPS helps with advanced usage and data interoperability.

Where can I learn more about LAPS? See Appendix 9.3 for a detailed schema reference, or visit MIT CORD for additional documentation.

8.2 Getting Help

If you cannot resolve an issue:

1. Check this manual for guidance
2. Visit the StraboSpot website for updates
3. Contact the StraboSpot team through the website
4. Report bugs or request features through the appropriate channels

When reporting issues, please include:

- Description of the problem
- Steps to reproduce the issue
- Browser and operating system
- Screenshots if applicable
- Any error messages displayed

9 Appendices

9.1 Field Types

StraboExperimental uses consistent form components throughout the application:

9.1.1 Text Fields

- Single-line text input for names, IDs, and short values
- Multi-line textarea for descriptions and notes
- Required fields are marked with an asterisk (*)

9.1.2 Dropdown Selectors

- Click to open the dropdown list
- Type to filter options
- Select from controlled vocabulary lists
- “Other” option available when custom values are needed

9.1.3 Conditional Fields

Some fields appear based on other selections:

- Selecting “Natural Material” reveals mineral and rock type options
- Selecting “Other” in dropdowns reveals a text field for custom entry

9.1.4 Parameter Editors

Dynamic lists for entering multiple parameters:

- Click **Add Parameter** to add a new row
- Enter parameter type, value, min/max, unit, and notes
- Click the delete icon to remove a parameter

9.1.5 File Attachments

For attaching files to records:

- Click **Choose File** to select a document
- Add a description for the document
- Progress bar shows upload status
- Click the view link to open uploaded documents

9.2 Keyboard Shortcuts

Shortcut	Action
`Tab`	Move to next form field
`Shift+Tab`	Move to previous form field
`Enter`	Confirm selection in dropdowns
`Escape`	Close modal dialogs
`Ctrl/Cmd+S`	Save current form (browser dependent)
`Ctrl/Cmd+C`	Copy selected text
`Ctrl/Cmd+V`	Paste text

9.3 LAPS Schema Reference

The LAPS (Laboratory Apparatus and Protocol Schema) defines the data structure used in StraboExperimental. This appendix provides a detailed reference.

9.3.1 Schema Overview

LAPS organizes experimental data hierarchically:

```
Project
      Experiment
            Facility
                  Address, Contact
            Apparatus
                  Features
                  Parameters
                  Documents
            Sample
                  Parent Sample
                  Material (Type, Provenance, Texture, Composition)
                  Geometry
                  Parameters
                  Documents
            Experimental Setup
                  Assembly
                  Geometry
                  Parameters
                  Documents
            DAQ
                  Channels
                        Header
                        Sensor/Actuator
                        Calibration
            Protocol
                  Segments
```

```
        Controlled Variables
Data
        Datasets
        Parameters
        Files
```

9.3.2 Facility Schema

Field	Type	Description
name*	String	Facility name
type*	Enum	Facility type (University Lab, etc.)
other_type	String	Custom type if “Other” selected
facility_id	String	Internal identifier
institute*	String	Parent institution name
department	String	Academic department
website	URL	Facility website
description	Text	Facility description
street	String	Street address
building	String	Building name/number
postcode	String	Postal code
city	String	City
state	String	State/Province
country	String	Country
latitude	Number	Geographic latitude
longitude	Number	Geographic longitude
contact_firstname	String	Contact first name
contact_lastname	String	Contact last name
contact_affiliation	String	Contact affiliation
contact_email	Email	Contact email
contact_phone	String	Contact phone
contact_website	URL	Contact website
contact_id	String	ORCID or other ID

9.3.3 Apparatus Schema

Field	Type	Description
name*	String	Apparatus name
type*	Enum	Apparatus type (46 options)
other_type	String	Custom type if “Other” selected
location	String	Location within facility
apparatus_id	String	Internal identifier
description	Text	Technical description
features	Array	List of capability features
parameters	Array	Operational parameters

Field	Type	Description
documents	Array	Attached files

9.3.4 Sample Schema

Field	Type	Description
name	String	Sample name
id	String	Sample identifier
igsn	String	International Generic Sample Number
description	Text	Sample description
parent_name	String	Parent sample name
parent_id	String	Parent sample ID
parent_igsn	String	Parent sample IGSN
material_type	Enum	Material classification
starting_form	Enum	Initial form (Core, Gouge, etc.)
origin	Enum	Natural, Synthetic, Other
mineral_types	Array	Selected minerals
rock_type	String	Rock classification
geometry	Object	Sample dimensions
parameters	Array	Sample parameters
documents	Array	Attached files

9.3.5 DAQ Channel Schema

Field	Type	Description
header_type*	Enum	Measurement type
spec_a*	Enum	Primary specifier
spec_b	Enum	Secondary specifier
header_unit*	Enum	Measurement unit
number	Integer	Channel number (1-64)
type	Enum	Input/Output type
configuration	Enum	Signal configuration
resolution	Integer	Bits of resolution
range_low	Number	Range minimum
range_high	Number	Range maximum
rate	Number	Sampling rate
filter	String	Filter settings
gain	Enum	Amplifier gain
sensor_type	Enum	Sensor classification
sensor_manufacturer	String	Manufacturer
sensor_model	String	Model number
sensor_serial	String	Serial number

Field	Type	Description
cal_template	Enum	Calibration method
cal_date	Date	Calibration date
cal_data	Array	Calibration points

9.4 Controlled Vocabulary Lists

9.4.1 Facility Types

- University Lab
- Government Facility
- Private Industry Lab
- Shared Facility
- Military
- Other

9.4.2 Apparatus Types

- Atomic Force Microscope
- Biaxial Machine
- Creep Apparatus
- Diamond Anvil Cell
- Direct Shear Apparatus
- Double Direct Shear
- Fatigue Tester
- Gas Gun
- Griggs Apparatus
- Hele-Shaw Cell
- Indentation Cell
- Monoaxial Press
- Multi-Anvil Apparatus
- Nanoindenter
- Paterson Apparatus
- Permeameter
- Piston-Cylinder
- Rotary Shear Machine
- Split Hopkinson Bar
- Triaxial Press
- Triaxial Vessel
- True Triaxial Apparatus
- Uniaxial Piston Cylinder
- And more...

9.4.3 Material Types

- Ceramic
- Glass
- Metal
- Natural Material
- Polymer
- Semiconductor
- Other

9.4.4 Channel Header Types

- Time
- Temperature
- Pressure
- Strain
- Displacement
- Stress
- Load
- Electrical
- Chemistry
- Other

9.4.5 Sensor/Actuator Types

- Accelerometer
- Acoustic Emission Sensor
- Capacitance Sensor
- Diaphragm Gauge
- Displacement Transducer
- Encoder
- Force Transducer
- Laser Interferometer
- Load Cell
- LVDT
- Piezoelectric Sensor
- Pressure Transducer
- Strain Gauge
- Thermocouple
- And many more...

9.5 Glossary

Apparatus Experimental equipment used to conduct tests, such as a triaxial press or diamond anvil cell.

Calibration The process of determining the relationship between sensor output and the physical quantity being measured.

Channel A single data acquisition input or output, typically connected to one sensor or actuator.

Controlled Variable A parameter that is actively maintained at a specified value during an experiment.

DAQ (Data Acquisition) The system of hardware and software used to collect and record experimental data.

Dataset A collection of data from an experiment, typically including time-series measurements.

Experiment A complete experimental test, including sample, apparatus, setup, and results.

Facility A research laboratory or institution where experiments are conducted.

FAIR Findable, Accessible, Interoperable, and Reusable—principles for scientific data management.

Feature A capability or characteristic of an apparatus or experiment.

Geometry The physical dimensions and configuration of a sample or experimental assembly.

IGSN International Generic Sample Number—a persistent identifier for physical samples.

JSON JavaScript Object Notation—a lightweight data interchange format used for import/export.

LAPS Laboratory Apparatus and Protocol Schema—the standardized data schema used by StraboExperimental.

LVDT Linear Variable Differential Transformer—a type of displacement sensor.

Metadata Data that describes other data, such as experiment configuration and sample properties.

Parameter A measurable or controllable quantity in an experiment.

Project A collection of related experiments in StraboExperimental.

Protocol The step-by-step procedure followed during an experiment.

Provenance The origin and history of a sample.

Sample The material being tested in an experiment.

Schema A structured framework that defines how data is organized.

Sensor A device that converts a physical quantity into an electrical signal.

SI Prefix Standard prefixes for units of measurement (milli-, kilo-, mega-, etc.).

StraboSpot The ecosystem of applications for geological data management, including StraboField, StraboMicro, and StraboExperimental.

Template A pre-configured experiment that can be copied and modified for new experiments.

Time Series Data recorded as a sequence of measurements over time.

9.6 API Reference

StraboExperimental provides a REST API for programmatic access. Key endpoints include:

9.6.1 Project Endpoints

```
GET  /experimental/api/get_projects.php      - List all user projects
GET  /experimental/api/get_project.php?id=X  - Get project with experiments
POST /experimental/api/save_project.php      - Create/update project
POST /experimental/api/delete_project.php    - Delete project
GET  /experimental/api/download_project.php  - Download project as JSON
```

9.6.2 Experiment Endpoints

```
GET  /experimental/api/get_experiment.php?id=X  - Get experiment data
POST /experimental/api/save_experiment.php     - Create/update experiment
POST /experimental/api/delete_experiment.php    - Delete experiment
GET  /experimental/api/download_experiment.php  - Download as JSON
```

9.6.3 Repository Endpoints

```
GET  /experimental/api/get_facilities.php     - List all facilities
GET  /experimental/api/get_apparatus_list.php - List apparatus repository
```

For complete API documentation, contact the StraboSpot team.

9.7 Version History

9.7.1 Current Version (2025)

- Complete rewrite using Vue.js 3, Vite, and Tailwind CSS
- PrimeVue component library with Aura Dark theme
- Enhanced DAQ channel configuration
- Improved protocol editor with controlled variables
- PDF export functionality
- Bulk data loading features
- Feature selector with collapsible categories

9.7.2 Previous Versions

- Initial prototype presented at AGU 2023
- LAPS schema development with MIT CORD
- Integration with StraboSpot ecosystem

9.8 Contact Information

Website `https://strabospot.org`

Support Contact through the StraboSpot website

LAPS Schema MIT Consortium for Rock Deformation (CORD)

9.9 License

StraboExperimental is open-source software developed with support from the National Science Foundation. The application and its documentation are provided for the benefit of the scientific community.

For specific licensing terms, please refer to the project repository and the StraboSpot website.